

# **CALFED REVISED PHASE II REPORT**

**November 1998**

**CALFED Bay-Delta Program  
1416 Ninth Street, Suite 1155  
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**WORK-IN-PROGRESS**

**STAFF DRAFT - For Discussion Only**

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**ATTACHMENTS**

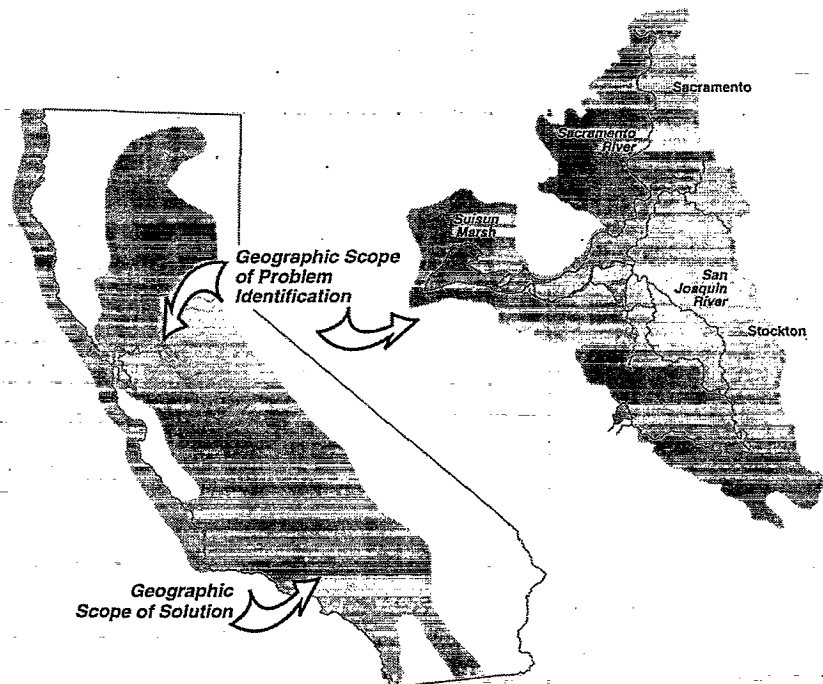
- A. Analyses with Distinguishing Characteristics
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- C. Summary of Major Issues Raised on Public Comments
- D. Actions and Assurances for 1998-99 Under Existing Authorities
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- F. Financing Plan

# 1. INTRODUCTION

A maze of tributaries, sloughs, and islands, the San Francisco Bay/Sacramento-San Joaquin Delta estuary (Bay-Delta) is the largest estuary on the West Coast. It is a haven for plants and wildlife, supporting over 750 plant and animal species. The Bay-Delta includes over 738,000 acres in five counties. The Bay-Delta is critical to California's economy, supplying drinking water for two-thirds of Californians and irrigation water for over 7 million acres of the most highly productive agricultural land in the world.

The Bay-Delta is also the hub of California's two largest water distribution systems - the Central Valley Project (CVP) operated by the U.S. Bureau of Reclamation and the State of California's State Water Project (SWP). The CVP and SWP were built to provide river regulation, improvements in navigation and flood control, water supplies for irrigation, municipal, and industrial uses, and hydropower generation. In addition, at least 7,000 other permitted water diverters, some large and some small, have developed water supplies from the watershed feeding the Bay-Delta estuary. Together, these water development projects divert about 20 percent to 70 percent of the natural flow in the system depending on the amount of runoff available in a given year.

These diversions along with the effects of increased population pressures throughout California, the introduction of exotic species,



## Geographic Scope for Problems and Solutions

The geographic scope for the problems consists of the legally defined Delta, Suisun Bay (extending to the Carquinez Strait) and Suisun Marsh.

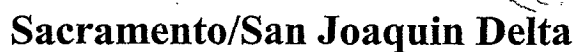
The geographic scope for developing possible solutions includes a much broader area that extends both upstream and downstream of the Bay-Delta. This solution scope includes the Central Valley watershed, the Southern California water system service area, San Pablo Bay, San Francisco Bay and near-shore portions of the Pacific Ocean out to the Farallon Islands and north to the Oregon border.

water pollution, and numerous other factors have had a serious impact on the fish and wildlife resources in the Bay-Delta estuary. This impact, as well as other effects of the continued resource conflicts in the Bay-Delta system, are discussed in detail in Chapter 2.

Although all agree on the importance of the Bay-Delta estuary for both fish and wildlife habitat and as a reliable source of water, few agree on how to manage and protect this valuable resource. In the past two decades, these disagreements have increasingly taken the form of protracted litigation and legislative battles; as a result, progress on virtually all water-related issues has become mired down, approaching gridlock.

The CALFED Bay-Delta Program was established to reduce conflicts in the system by solving problems in ecosystem quality, water quality, water supply reliability, and levee and channel integrity. The Program seeks to do this by developing a long-term comprehensive plan that will restore ecological health and improve water supply and water supply reliability for beneficial uses of the Bay-Delta system. The Program has crafted alternatives that improve water quality so as to protect Delta drinking water supplies and improve the quality of aquatic habitat. Maintaining and improving the integrity of Delta levees and channels will protect agricultural, urban, and environmental uses within the Delta and protect the quality of water used elsewhere in the state. Water conservation and recycling programs can assure the efficient use of existing water supplies and any new supplies developed through the Program. **The CALFED mission, objectives, and solution principles shown in the box on page 6 guide how the Program will be implemented to ensure that all aspects of the system are improved, together.**

Given the history of conflict in the Bay-Delta system, CALFED recognizes that any proposed program to address this broad spectrum of resources will be controversial. Stakeholders participating in the CALFED process have already identified significant concerns about virtually every component in the Program. CALFED encourages all members of the public to review the material in this report and to provide comments for further consideration.





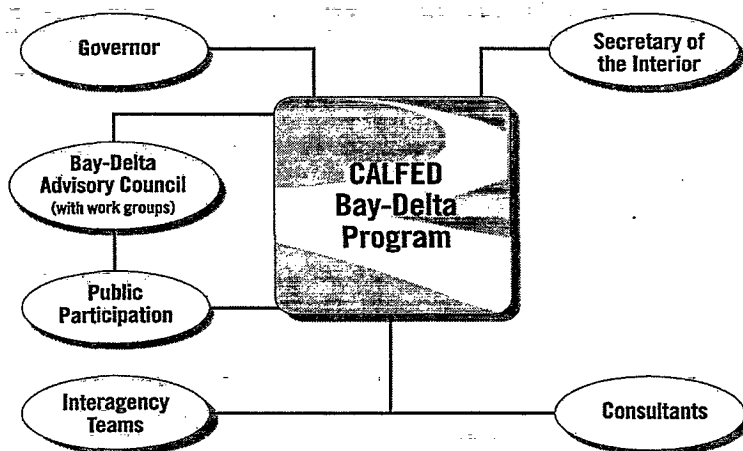
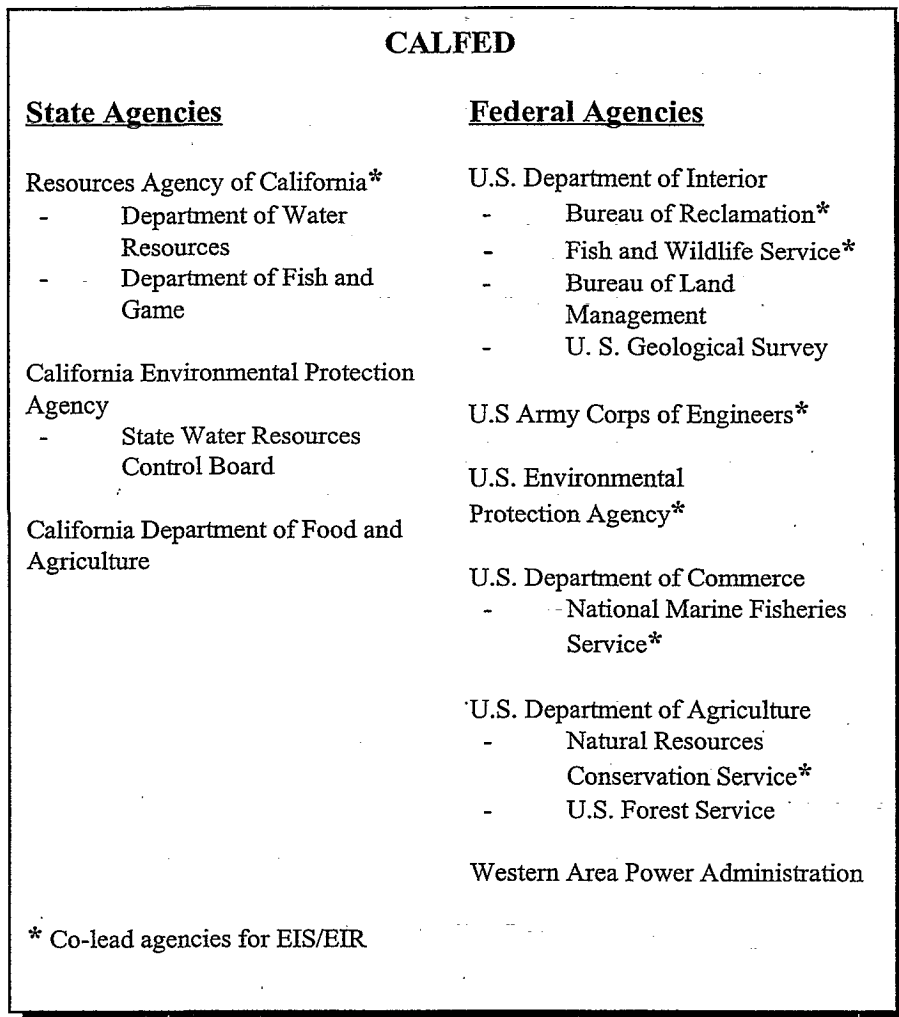
## Watershed for the Sacramento/San Joaquin Delta

## The Program

The CALFED Bay-Delta Program began in May of 1995 to address the tangle of complex issues that surrounds the Delta. The CALFED Program is a cooperative, interagency effort of state and federal agencies with management or regulatory responsibilities for the Bay-Delta.

The CALFED agencies appointed an executive director to oversee the process of developing a long-term comprehensive plan for the Bay-Delta. The Executive Director selected staff from the CALFED agencies to carry out the task. In addition, the CALFED agencies and stakeholders worked with the interagency CALFED Program team through multi-level technical and policy teams.

The CALFED Program is a collaborative effort including representatives of agricultural, urban, environmental, fishery, business, and rural counties who have contributed to the process. The Bay-Delta Advisory Council (BDAC), a 34-member federally chartered citizens' advisory committee, provides formal comment and advice to the agencies





during regularly scheduled public meetings. In addition, the CALFED process has included members of the public in development of every Program component from ecosystem restoration to financing.

### **CALFED BAY-DELTA PROGRAM MISSION STATEMENT, OBJECTIVES AND SOLUTION PRINCIPLES**

*The mission of the CALFED Bay-Delta Program is to develop a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system.*

CALFED developed the following objectives for a solution:

- Provide good water quality for all beneficial uses;
- Improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species
- Reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system
- Reduce the risk to land use and associated economic activities, water supply, infrastructure and the ecosystem from catastrophic breaching of Delta levees.

In addition, any CALFED solution must satisfy the following **solution principles**:

- **Reduce Conflicts in the System** Solutions will reduce major conflicts among beneficial uses of water.
- **Be Equitable** Solutions will focus on solving problems in all problem areas. Improvements for some problems will not be made without corresponding improvements for other problems.
- **Be Affordable** Solutions will be implementable and maintainable within the foreseeable resources of the Program and stakeholders.
- **Be Durable** Solutions will have political and economic staying power and will sustain the resources they were designed to protect and enhance.
- **Be Implementable** Solutions will have broad public acceptance and legal feasibility, and will be timely and relatively simple to implement compared with other alternatives.
- **Have No Significant Redirected Impacts** Solutions will not solve problems in the Bay-Delta system by redirecting significant negative impacts, when viewed in their entirety, within the Bay-Delta or to other regions of California.

## Phase I

The Program was divided into three discrete phases. In Phase I, completed in September 1996, CALFED identified the problems confronting the Bay-Delta, developed a mission statement and guiding principles, and devised three preliminary categories of solutions for Delta water conveyance.

Following scoping, public comment, and agency review, CALFED concluded that each Program alternative would include a significant set of Program elements addressing problems for levee system integrity, water quality improvements, ecosystem restoration, and water use efficiency measures. Two additional elements (water transfers and watershed management) were added to each alternative because of their value in helping the Program meet its multiple objectives. These six program elements have generally been referred to as the *common programs*. In addition, CALFED identified three preliminary alternatives to be further analyzed in Phase II. The three preliminary alternatives represented three differing approaches to conveying water through the Delta. The first conveyance configuration relied primarily on the existing conveyance system, with some minor changes in the south Delta. The second configuration relied on enlarging channels within the Delta. The third configuration included in-Delta channel modifications and a conveyance channel that would move some water around the Delta. Each of these alternatives also included consideration of new ground and surface water storage options.

## Phase II

CALFED is currently in Phase II, which will end in late 1999 at the time of the Final Programmatic Environmental Impact Statement/Environmental Impact Report (EIS/EIR). A programmatic EIS/EIR, also referred to as a first-tier document, is typically prepared for a series of actions that can be characterized as one large project and is required for actions proposed by or approved by state and federal agencies. In Phase II, CALFED is developing a preferred program alternative, is conducting comprehensive programmatic environmental review, and is developing the implementation plan.

This Revised Phase II Report primarily focuses on the draft preferred program alternative including background, description, and implementation plan. The full EIS/EIR which will be released separately, other technical appendices, and supporting technical reports -- comprising thousands of pages -- are available from CALFED and major libraries throughout the state.

## Phase III

In Phase III, following completion of the Final Programmatic EIS/EIR, implementation will begin. This period will include additional site-specific environmental review and permitting, as

necessary. Because of the size and complexity of any of the alternatives, implementation is likely to take place over a period of decades. Part of the challenge for Phase II is designing an implementation strategy that acknowledges this long implementation period and keeps all participants committed to the successful completion of all phases of implementation.

## Public Involvement

During Phase I, which ended September 1996, CALFED held scoping meetings, technical workshops, public information meetings, and public BDAC workgroup meetings. The commitment to active public involvement has continued through Phase II with additional public meetings, presentations before focused groups, media outreach, special mailings of newsletters, regularly updated information on the Program's Web site, and a toll-free public information telephone line.

In addition to the general public meetings and stakeholder workshops, 17 formal public hearings on the draft programmatic EIS/EIR were held around the state between April 21 and May 28, 1998.

The Program has worked to involve California's diverse multi-cultural communities by producing fact sheets in five languages (Spanish, Chinese, Japanese, Korean, and Vietnamese), meeting with multi-cultural business, media, social service and agricultural organizations, and placing media notices in ethnic media outlets. Increasing awareness and knowledge among the multi-cultural communities is a continued goal of CALFED's public outreach.

### WHERE TO FIND PUBLIC OUTREACH INFORMATION

- Program's website (<http://calfed.ca.gov>)
- Toll-free public information telephone line (1-800-700-5752)
- *CALFED News, EcoUpdate* and Factsheets (available from CALFED Bay-Delta Program, 1416 Ninth Street, Suite 1155, Sacramento, CA 95814; phone 916-657-2666)
- BDAC and other public meetings

## Next Steps in Phase II

Between the Revised Draft Programmatic EIS/EIR and the Final EIS/EIR in late 1999, work will continue on refining and evaluating the preferred program alternative. This will include additional technical evaluations. CALFED will work with elected officials, local agencies, interest groups, and the public over the coming months to finalize the preferred program alternative.

A new public comment period on the Revised Draft Programmatic EIS/EIR will begin in early 1999, including public hearings throughout the state. The Final Programmatic EIS/EIR is scheduled for late 1999.

### Some Delta Statistics

**Area of the Watershed:** The system drains more than 61,000 square miles, or 37% of the state.

**Area of the Delta:** The legal Delta includes 738,000 acres.

**Delta Inflow\*:** Historic inflow ranges from 6 to 69 million acre feet (MAF) per year; average is 24 MAF.

**Diversions:** Over 7,000 diverters draw water from the system, including 1,800 in the Delta itself.

**Delta Exports\*:** The SWP and CVP draw an average of 5.9 MAF (approximately 3.6 MAF for agriculture and 2.3 MAF for urban uses) from the Delta each year.

**In-Delta Water Use:** Net in-Delta water use averages approximately 1 MAF annually.

**Flora:** Over 400 plant species can be found in the Delta, not including agricultural crops.

**Fauna:** The Delta harbors about 225 birds, 52 mammals, and 22 reptile and amphibian species.

**Fish:** There are 54 fish species in the Delta, and a total of 130 in the Delta and Bay.

**Marshes:** There are 8,000 acres of tidal marsh in the Delta; originally, there were 345,000 acres.

**Levees and Channels:** Over 700 miles of waterways are protected by 1100 miles of levees.

**Subsidence:** Some Delta lands are more than 20 feet below sea level.

**Delta Farmland:** Over 520,000 acres are farmed in the Delta.

**Principal Crops:** The most commonly grown Delta crops are wheat, alfalfa, corn, and tomatoes.

**Agricultural Value:** Average annual gross value of Delta production is \$500 million.

**Recreation:** Recreational use of the Delta is about 12 million user days per year

\* Simulated flow based on historical hydrology, but with existing storage and conveyance facilities in place and operating to meet 1995 levels of demand.



## 2. BACKGROUND

### 2.1 Bay-Delta Problems/Objectives

There is a rich history of conflict over resource management in the Bay-Delta system. For decades the region has been the focus of competing interests--economic and ecological, urban and agricultural. These conflicting demands have resulted in several resource threats to the Bay-Delta: the decline of wildlife habitat; the threat of extinction of several native plant and animal species; the collapse of one of the richest commercial fisheries in the nation; the degradation of the Delta water quality; and a Delta levee system faced with a high risk of failure.

At the simplest level, problems occur when there is conflict over the use of resources from the Bay-Delta system. As population increases, California asks more of the system, and there is more conflict. Single-purpose efforts to solve problems often fail to address the conflict. To the extent that these efforts acquire or protect resources for one interest, they may cause impacts on other resources and increase the level of conflict. Major conflicts are summarized below.

- *Fisheries and Water Diversions.* The conflict between fisheries and water diversions results primarily from fish mortality attributable to water diversions. This includes direct loss at pumps, reduced survival when young fish are drawn out of river channels into the Delta, reduced spawning success of adults when migratory cues are altered, and reduced survival associated with inadequate stream flows and reduced Delta outflows. The need to protect species of concern has prompted restrictions on pumping and other regulations that allow sufficient fishery flows to remain in the natural system, which restricts the quantity and timing of diversions.
- *Habitat and Land Use.* Habitat to support various life stages of aquatic and terrestrial plants and animals in the Bay-Delta has been lost because of conversion of that habitat to agricultural and urban uses. In addition, some habitat has been lost or adversely altered due to construction of flood control facilities and levees needed to protect developed land. Efforts to restore the habitat can also create conflict with existing uses, such as agriculture and levee maintenance.
- *Water Supply Availability and Beneficial Uses.* As water use and competition for water have increased during the past several decades, so has conflict among users. A major part of this conflict is between the volume of instream water needs and out-of-stream water needs, and the timing of those needs within the hydrologic cycle.

- **Water Quality and Human Activities.** Water quality for ecosystem and consumptive uses can be adversely affected by a broad range of human activities. In addition to particular activities that discharge pollutants (such as abandoned mines or industrial sources), urban and agricultural areas produce degraded surface runoff that can seriously affect the Bay-Delta's many beneficial uses.

From these central conflicts, CALFED identified a series of problems in each of four problem areas. From each problem, a Program objective was developed. A complete set of identified problems and program objectives is contained in the *Program Goals and Objectives Appendix* to the Draft Programmatic EIS/EIR. The four problem areas for the Bay-Delta system are:

**Ecosystem Quality** - The Bay-Delta system no longer provides a broad diversity of habitats nor the habitat quality necessary to maintain ecological functions and support healthy populations and communities of plants and animals. Declining fish populations and endangered species designations have generated major conflicts among instream and consumptive water users in the Bay-Delta system. The health of the Bay-Delta ecosystem has declined in response to a loss of habitat to support various life stages of aquatic and terrestrial biota and a reduction in habitat quality due to several factors including diversion of water, toxics, and exotic species.

The primary ecosystem quality objective of the Program is to "improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species." The strategy to achieve this objective is to begin recovery of ecosystem health by reducing or eliminating factors that degrade habitat, impair ecological functions, or reduce the population size or health of species.

The ecosystem restoration program (ERP) is the largest, most comprehensive, and most inclusive environmental restoration program in the United States. It provides a new perspective to restoration science by focusing on the rehabilitation, protection, or restoration of ecological processes which create and maintain habitats needed by fish, wildlife, and plant species dependent on the Delta and its tributary streams. The program is supported by an implementation strategy that emphasizes solid science, adaptive management, and local participation: an innovative approach that is becoming a model for similar efforts throughout the nation.

**Water Supply Reliability** - During the past several decades, as water diversions and recognition of environmental water needs have both increased, conflicts between these water uses has also increased. Heightened competition and conflict during certain seasons or during water-short years has magnified the impact from natural fluctuations in water flow. In response to declining fish and wildlife populations, water flow and timing requirements have been established for certain fish and wildlife species. Over the past

decade, a number of actions including the Central Valley Project Improvement Act and the Delta Accord have reallocated over 1 million acre-feet (MAF) of dry year CVP/SWP water supply for environmental purposes. These requirements have reduced flexibility to meet the quantity and timing of water exports from the Delta. There are concerns that additional restrictions that might be needed to protect species could increase the uncertainty of Delta water supplies. This basic disparity between water needs and water availability has created economic uncertainty in the water service areas and increased conflict over supplies.

The primary water supply objective of the Program is to "reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system." The Program has a three-part strategy to reduce conflict and meet water supply reliability objectives. This strategy seeks to reduce the mismatch between supply and beneficial uses through a variety of actions including increasing the ability and flexibility to store and transport water, reducing the impact of water diversions on the Bay-Delta system, and managing demand by increasing conservation and water transfer markets.

**Water Quality** - The Delta is a source of drinking water for millions of Californians and is critical to the state's agricultural sector. In addition, good water quality is required to maintain the high quality habitat needed in the Bay-Delta system to support a diversity of fish and wildlife populations. Bay-Delta water quality is a primary concern.

The primary water quality objective of the Program is to "provide good water quality for all beneficial uses." Good water quality means different things to different users, and there are different ways to achieve the objective. For example, organic carbon that is naturally present in Delta water can contribute to carcinogenic treatment byproducts in drinking water, but this carbon supports the primary productivity and ecological function of the Bay-Delta system. The Program's strategy to achieve the water quality objective includes reducing or eliminating parameters that degrade water quality at its source. Many of the Program's water quality sub-objectives concentrate on this direct source control approach.

**Levee System Integrity** - Settlers first constructed levees in the Sacramento-San Joaquin Delta during the late 1800s. Initially settlers built levees to turn swamp and overflow lands into agricultural land and over time increased the levee heights to maintain protection as both natural settling of levees and shallow subsidence of Delta island soils occurred (biological oxidation, peat fires, and wind erosion have lowered interior island elevations over time). The increased levee heights combined with poor levee construction, and inadequate levee maintenance makes Delta levees vulnerable to failure, especially during earthquakes or floods. Delta island farmland, residences, wildlife habitat, and critical infrastructure can be flooded as a result of a levee failure. Levee



failure on specific Delta islands can have direct or indirect impacts on water supply distribution systems. Direct impacts result from flooding of distribution systems such as the Mokelumne Aqueduct, and indirect impacts result from salty water moving up into the Delta, as an island is inundated under non-flood conditions. The increased salinity in the Delta would be of particular concern in a low water year, when less freshwater would be available to flush out the salt water (such as occurred when the Brannan Andrus Island levee failed in 1972). Long-term flooding of specific Delta islands can have an effect on water quality by changing the rate and area of the mixing zone. A long interruption of water supply for in-Delta and export use by both urban and agricultural users could result, until the salt water could be flushed from the Delta.

The primary levee system vulnerability objective of the Program is to "reduce the risk to land use and associated economic activities, water supply, infrastructure, and the ecosystem from catastrophic breaching of Delta levees." Failure of Delta levees can result either from catastrophic events, such as earthquakes and floods, or from gradual deterioration. Subsidence of the Delta island peat soils and settling of levee foundations places additional pressure on levees and increases the risk of failure. The Program's strategy for achieving the levee system integrity objectives is to implement a comprehensive plan to address long-term levee stabilization and develop an effective emergency response capability in the event of failure while providing opportunities to maintain and enhance ecosystem values.

The unprecedented scope of the CALFED Bay-Delta Program cannot be overstated. The vast geographic extent of the area under consideration, the variety and complexity of the hydrological and ecological process involved, the history of conflict among the affected interests, and the magnitude of the potential economic consequences for California's commercial, agricultural, and industrial base all combine to make this effort the most ambitious of its kind anywhere in the world. In the United States, only the well-known efforts at addressing environmental and institutional problems in the Columbia River Basin, Chesapeake Bay, and in the Florida Everglades can serve as comparisons.

## 2.2 Fundamental Program Concepts

Three fundamental concepts related to the Bay-Delta system and its problems have guided the development of proposed CALFED solutions. These concepts are not new, but CALFED has looked at them in new ways to develop options for solving problems successfully.

First, the four problem areas (ecosystem quality, water quality, water supply reliability, and levee system integrity) are **interrelated**. CALFED cannot effectively describe problems in one problem area without discussing the other problem areas. It follows that solutions will be

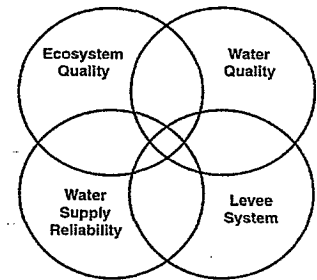
interrelated as well; many past attempts to improve a single problem area have achieved limited success because solutions were too narrowly focused.

Second, there is great **variation** in the flow of water through the system and in the demand for that water at any time scale we might examine (from year to year, between seasons, even on a daily basis within a single season). The value of water for all uses tends to vary according to its scarcity and timing. CALFED can take advantage of this variability to reduce conflict and solve problems in several resource areas.

Finally, the solutions must be guided by **adaptive management**. The Bay-Delta ecosystem is exceedingly complex, and it is subject to constant change as a result of factors as diverse as global warming and the introduction of exotic species. CALFED will need to adapt management of the system as we learn from our actions and as conditions change.

## Interrelationships

In the past, most efforts to improve water supply reliability or water quality, improve ecosystem health, or maintain and improve Delta levees were single-purpose projects. A single purpose can keep the scope of a project manageable but may ultimately make the project more difficult to implement. The difficulty occurs because a project with narrow scope may help to solve a single problem but have impacts on other resources, causing other problems. This in turn leads to conflict. Ultimately no problem is solved, or one problem is solved while others are created.



The CALFED Program takes a different approach, recognizing that many of the problems in the Bay-Delta system are interrelated. Problems in any one problem area cannot be solved effectively without addressing problems in all four areas at once. This greatly increases the scope of our efforts but will ultimately enable us to make progress and move forward to a lasting solution.

Significantly, there are many linkages among the objectives in the four problem areas and among the actions that might be taken to achieve these objectives. Solving problems in four areas at once does not require a four-fold increase in the cost or number of actions. Most actions that are taken to meet program objectives, if carefully

### **Eight Program Elements Working Together to Solve the Four Problem Areas**

- Long-Term Levee Protection Plan
- Water Quality Program
- Ecosystem Restoration Program
- Water Use Efficiency Program
- Water Transfer Program
- Watershed Program
- Storage
- Conveyance

developed and implemented, will make simultaneous improvements in two, three, or even four problem areas.

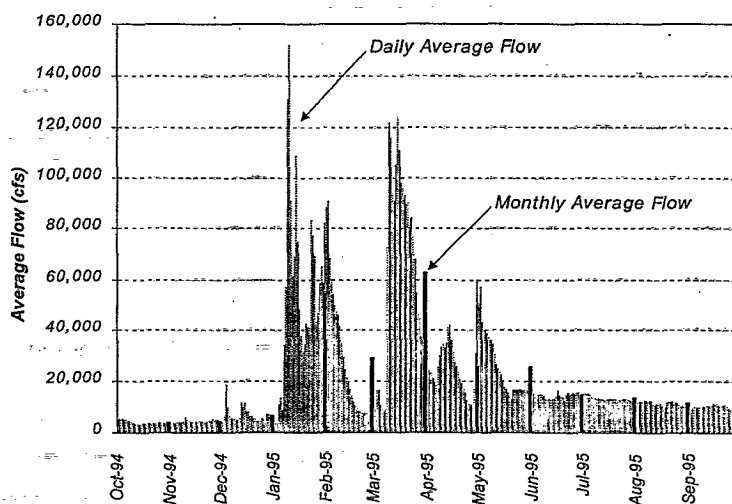
What kinds of actions can be taken to solve problems in the Bay-Delta system? The actions can be grouped into categories of levee system improvements, water quality improvements, ecosystem restoration, water use efficiency, water transfers, watershed management, water storage, and Delta conveyance modifications. Specific actions range from physical restoration of habitat in the Delta to water conservation measures. Programmatic descriptions of the eight program elements are presented in Chapter 4 of this document. More detailed descriptions for the first stage implementation are presented in Chapter 5. Complete descriptions of Program elements are contained in various *Program Plans*.

## System Water Variability

The watershed of the Bay-Delta system is subject to a highly variable rain and snowfall pattern. The total amount of precipitation and runoff in the watershed varies widely from month to month and from year to year. Year types are classified from wet to critically dry. Within any given year, whether wet or dry, most of the rain falls in the winter months, while snow pack typically melts in the late spring and early summer. In other months, water flow is typically much lower, leading to dramatically different flow levels for different months. Even within each month, flow can vary widely.

Planners often discuss water in terms of averages that describe overall system performance-- average Delta outflow, average water project deliveries -- but there is more conflict over water management in drier years than in average years. Furthermore, average values are misleading because they mask the incredible variability in flows in the Bay-Delta system. An increase in average outflow may have a minor beneficial effect on the environmental health of the system, but if outflow can be increased during a dry year or during a critical period within a year, the benefits will be far greater. Similarly, an increase in water supplies for urban and agricultural users may be desirable during an average year, but will be critically important to local economies during a drought.

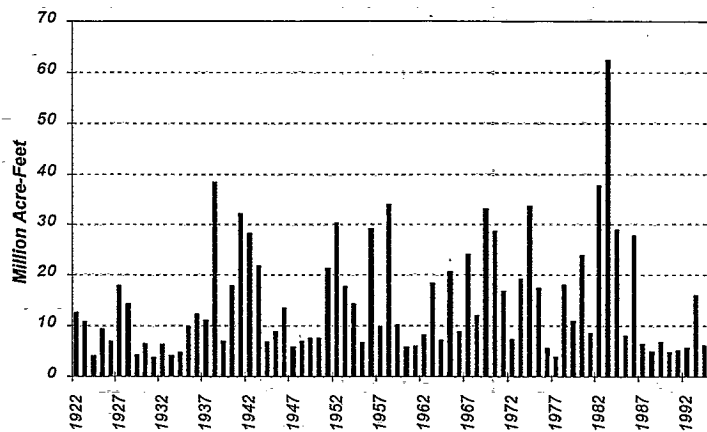
**Sacramento River Flow at Hamilton City  
Water Year 1995**



Two figures help illustrate the variability in the hydrologic system. Water flow variability is most notable when daily flows are examined. The figure on the previous page presents a graph of daily flows throughout a water year. For comparison, average monthly flows are also shown (thicker black bars). The average monthly flows mask the much greater variation exhibited in daily flows that rise and fall with the passing of each major storm system. It is quite typical for winter and spring storms to produce periodic peaks in flow such as those shown in January, March, and May.

The figure at the right shows a simulated yearly total Delta outflow for the period from 1922 to 1994. The simulated Delta outflow is based on historical hydrology, but with existing storage and conveyance facilities in place and operating to meet 1995 level of demand. The graph reflects the average annual variability that occurs from year to year. Memorable extremes, such as the drought of 1976-77, are quite apparent. It is during drought periods such as this that competition between water diverters and in-stream water needs are felt most keenly.

Yearly Total Delta Outflow



Demand for water also varies over time. Demands tend to be higher than average in dry years, because there is less natural soil moisture, and plants need more irrigation. Water demand also varies seasonally; the demand is highest in summer, when natural flows are lowest.

As these figures illustrate, averages obscure the reasons for conflict over Delta flow and Bay-Delta water management. Conflict arises when water is scarce, and the averages do not illustrate the scarcity that occurs at the low flow levels within a given month or year. The conflicts that arise during times when water is in short supply create the need for a more effective water management strategy.

**\*\*\*insert figures showing natural and modified flows in a drought year\*\*\*]**

In water years that are very dry, the natural peaks in flow may not be as high as in wetter years, or some of the typical peaks may not occur at all. Water is more valuable to all users in these dry years, so the peak flows may be further reduced through the operation of reservoirs in which scarce water is captured for use later in the year. Thus, the impact of water management activities on important peak flow events is greatest during years when natural flows may be most sensitive to disturbance. During wet years, approximately 20 percent of the water is diverted

from the system for other uses. In a critical year, approximately 70 percent of the water is diverted, and there is considerable conflict between fisheries and diversions. During years of low outflow, and especially during periods when fisheries depend on seasonal peaks for spawning and migration, water has its highest value for all beneficial uses.

The geologic record shows evidence of past substantial changes in global and regional climates with the resultant marks from flooding and droughts. Sea level changes are directly related to extremes in climate change. For example, sea levels were 2 to 6 meters higher than present levels during the last interglacial period of 125,000 years ago and approximately 120 meters below present levels during the last Ice Age, 20,000 years ago. Considering this wide range of sea level fluctuation, the Delta has likely existed with current sea levels for only small portions of the geologic history.

Future sea level changes are difficult to estimate because not enough is known about how the ice sheets in Greenland and Antarctica will react to global warming, and how much global warming may occur. Warming may cause not only melting of ice sheets and land-based glaciers, but some thermal expansion of the sea water itself. If global warming causes increased precipitation at very high latitudes and resultant storage of water in the ice sheets, sea level could actually decrease.

Estimates of current sea level rise in the neighborhood of 1.5 millimeters per year is typical in the literature. One study estimates that global warming may cause further rise of about 18 centimeters (0.7 foot) by the year 2030. Also, if current trends in greenhouse gas emissions continue, the study estimates the rise could amount to 1 meter (3.3 feet) above current levels by 2100. A similar evaluation by the U.S. Environmental Protection Agency estimates that sea levels may rise globally approximately 20 inches (range of 6 to 38 inches) by year 2100 and average global temperatures could increase by 2 degrees Celsius (range of 1 to 3.5 degrees C).

Rising sea levels could have significant adverse impacts on the Delta system (including habitat, water supply, and Delta agriculture) if levees are overtopped or if substantial future investments are required to prevent overtopping. Higher sea levels would increase salinity levels throughout the Delta and for many miles inland. This would alter the effectiveness of Program habitat restoration projects and likely alter the entire ecosystem of the Delta. Water diversions dependent on taking water from the Delta channels would likely need to be abandoned and moved inland to areas of lowered salinity. While these changes are potentially significant over the long term (hundreds or thousands of years), they are unlikely to significantly alter Program facilities or operations within the foreseeable future (20 to 50 years).

The long-term change in temperatures could result in more variability in precipitation and runoff from year to year and season to season. Higher flooding could become more common at times, and drought periods could become more frequent, increasing competition for remaining scarce water supplies. Some estimates indicate that California will experience an increase in winter

runoff and a decrease in spring and summer runoff, with a resultant decrease in water supply and reliability in the Central Valley Basin.

[\*\*\*insert table of numbers to show demands and water shortages\*\*\*]

The above demonstrated system water variability, including the increasing water demands over time, requires efficient use of all available water management tools to satisfy the wide array of water demands (environmental, agricultural, and urban).

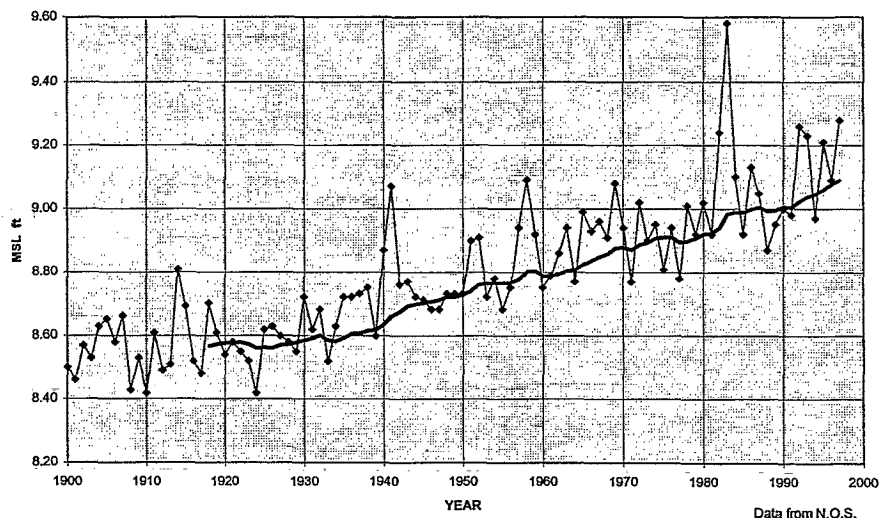
## Adaptive Management

A third fundamental concept of the Program is adaptive management.

No long-term plan for management of a system as complex as the Bay-Delta can predict exactly how the system will respond to Program efforts or foresee events such as earthquakes, climate change, or the introduction of new species to the system. For example, how will the CALFED levee program be adapted in the future if sea levels continue to rise?

The fundamental concept of adaptive management is that management prescriptions will be assessed and refined (adapted) according to new information in order to meet program goals and objectives. Adaptive management is an iterative process that involves: 1) identifying clear goals and objectives for the program elements; 2) using models to identify our understanding of the Bay-Delta system and to assess and prioritize a range of potential actions to improve the system; 3) implementation of actions

YEARLY AND 19 - YEAR MEAN SEA LEVEL AT THE GOLDEN GATE



and research most likely to achieve goals and objectives and to improve our knowledge of the system; and 4) monitoring and assessment of actions to gain information to refine the models and alter future actions in order to meet program goals and objectives.

Adaptive management, as an essential Program concept, acknowledges the need to constantly monitor the system and adapt the actions to restore ecological health and improve water management. These adaptations will be necessary as conditions change and as CALFED learns more about the system and how it responds. The Program's objectives will remain fixed over time, but actions can and should be adjusted to assure that the solution is durable.

The concept of adaptive management is an essential part of every CALFED Program element, as well. In every part of the Program, new or more intensive actions are proposed. Along with these proposed actions comes uncertainty. What actions work best to achieve program objectives? How can these actions be modified to work better, cost less, or be simpler to implement? How should the emphasis among actions change over time? Are there new or different actions that should complement or replace those that are being implemented? An adaptive management approach helps to answer these questions and act on those answers.

More detailed concepts of an adaptive management approach are included in the implementation plan in Chapter 5.

### 3. Preferred Program Alternative Development

At the beginning of Phase II of the CALFED Bay-Delta Program, seventeen alternative variations were developed around the three broad alternatives (existing system conveyance, modified through Delta conveyance, and dual Delta conveyance) resulting from the Phase I work. Five alternative variations were eliminated due to technical problems or to reduce duplication where two or more alternatives achieved the same Delta conveyance function. The remaining twelve alternative variations were described in the *Project Alternatives Technical Appendix* to the Draft Programmatic EIS/EIR in March 1998.

The March Draft Programmatic EIS/EIR did not specify a preferred program alternative but presented impact analyses of the twelve alternative variations. The twelve alternative variations represented a reasonable range of different configurations of Delta conveyance and storage assembled with the other program elements for levee system integrity, water quality, ecosystem quality, water use efficiency, water transfers, and watershed management. CALFED believed that the features and impacts of the preferred program alternative, when developed, largely would be covered by the range of analyses in the *Draft Programmatic EIS/EIR*. CALFED realized that some additional analyses may be required where the preferred program alternative fell outside this range.

To help the comparison of alternatives, the twelve alternative variations were grouped into the three broad categories:

**Alternative 1** - Includes program elements for ecosystem restoration, water quality, levee and channel integrity, water use efficiency, water transfers, and watershed management. In addition, Alternative 1 proposes the use of existing Delta channels, with some modifications, and various storage options.

**Alternative 2** - Includes program elements for ecosystem restoration, water quality, levee and channel integrity, water use efficiency, water transfers, and watershed management. In addition, Alternative 2 proposes significant modifications of interior Delta channels to increase water conveyance across the Delta, combined with various storage options.

**Alternative 3** - Includes program elements for ecosystem restoration, water quality, levee and channel integrity, water use efficiency, water transfers, and watershed management. In addition, Alternative 3 includes Delta channel modifications coupled with a conveyance channel that takes water around the Delta with various storage options.

Based on assumptions made for evaluations in the March *Phase II Interim Report*, the dual Delta conveyance with an isolated facility appeared to provide greater technical performance than the



other alternatives. At the same time, however, the dual Delta conveyance appeared to present the most serious challenges in terms of "assurances". Since March 1998, development of the draft preferred program alternative has focused on assurances and on refining the technical analyses. The need for better assurances and scientific information led CALFED to more fully integrate adaptive management throughout the program elements. This led to a draft preferred program alternative that will be implemented in stages over time. Each stage begins implementation of certain actions, gathers scientific information to help future decisions on other actions, and provides greater assurances that actions within each stage will move forward together and will be operated as intended. The draft preferred program alternative is discussed in more detail in Chapter 4.

Since March 1998, CALFED used a number of additional analyses to help sort through the performance of the alternatives, answer additional questions, and develop a draft preferred program alternative that best meets the CALFED Bay-Delta Program purpose. These are summarized in the following sections.

### 3.1 Distinguishing Characteristics

Looking simultaneously at all the information on how well the alternatives meet the objectives and how well they satisfy the solution principles would be nearly impossible due to the large amount of information. Furthermore, many aspects of the alternatives do not vary from one alternative to another. They all include program elements that make significant progress toward meeting program objectives and reducing conflict in the system.

On the other hand, there are aspects that do differ among the alternatives and it is these aspects, or distinguishing characteristics, that guided the evaluation. These characteristics are important when assessing the performance, impacts and overall merits of each alternative. Following are the eighteen identified distinguishing characteristics:

- **In-Delta Water Quality** - provides a measure of **salinity** and **flow circulation** for four areas of the Delta. The measure focuses on water quality for in-Delta agricultural uses.
- **Export Water Quality** - provides a measure of **salinity**, **bromide**, and **total organic carbon** for four export diversion location from the Delta. The measure focuses on municipal/industrial uses for the North Bay Aqueduct and Contra Costa Intake and for agricultural and municipal/industrial uses for the SWP and CVP export pumps in the south Delta.
- **Diversion Effects on Fisheries** - intended to include only the **direct effects on**

**fisheries due to the export diversion intake and associated fish facilities.**

These will vary depending on diversion location, size, type, method of handling bypassed fish, and annual volume of water diverted. The effects on flow patterns in the Delta as a result of the diversion are addressed in the distinguishing characteristic for "Delta Flow Circulation". The loss of fish due to diversion to another route is covered in this effect.

- **Delta Flow Circulation** - is intended to include the **direct and indirect effects of water flow circulation on fisheries due to the export diversions and changes in cross-Delta water conveyance facilities.** These will vary depending on diversion location, size, type, and operation of conveyance facilities, and annual volume of water diverted.
- **Storage and Release of Water** - provides a measure of the environmental benefit or adverse effects of storing water in a new Program storage facilities and releasing that water at a later time of need. Storing the water will generally result in some degradation of environmental conditions while releasing that water, for whatever use, will generally result in some environmental benefits.
- **Water Supply Opportunities** - is a measure of the change provided by the alternatives for water supply for the environment and for agricultural and urban uses.
- **Water Transfer Opportunities** - is an estimate of how well each alternative can carry water that may be generated through market sales or trades at different locations in the system.
- **Operational Flexibility** - provides an indication of how well each alternative can shift operations as needed from time to time to provide the greatest benefits to the ecosystem, water quality, and water supply reliability.
- **South Delta Access to Water** - is a measure of how the alternatives affect local beneficial use of water in the vicinity of the state and federal Delta export facilities due to changes in water levels and water quality in the channels.
- **Risk to Export Water Supplies** - is intended to provide a measure of which alternatives best reduce the risk to local and export water supplies from a catastrophic earthquake.
- **Total Cost** - will include the initial capital costs for the Program as well as annual costs. Initial costs will include study, design, permitting, construction, mitigation, acquisition, and other first costs of the Program. Annual costs will include

operation and maintenance, monitoring, reoccurring annual purchases, and other annual costs.

- **Assurances Difficulty** - is an estimate on how difficult it will be to formulate an assurance package and get consensus among agencies and stakeholders. It is not an assessment on the perceived effectiveness of the assurance package.
- **Habitat Impacts** - is an assessment of the adverse habitat impacts due to implementation of the storage and conveyance facilities.
- **Land Use Changes** - is primarily a measure of the amount of agricultural land that would change to other uses by implementation of the Program.
- **Socio-Economic Impacts** - include adverse and beneficial impacts on commercial and recreational fishing, farm workers, power production, and others indirectly affected by Program actions.
- **Consistency with Solution Principles** - provides a qualitative measure of how well the alternatives meet the Program solution principles. Alternatives which violate the solution principles are not likely to be practicable or implementable. The solution principles provide insight in considering tradeoffs among the other distinguishing characteristics in a balanced manner.
- **Ability to Phase (Stage) Facilities** - provides an indication on how easy it will be to stage implementation of storage and conveyance facilities over time.
- **Brackish Water Habitat** - In the Bay-Delta system there is a salinity gradient between fresh and salt water. The western Delta is an area of important aquatic habitat with salinity levels of approximately 2 parts per thousand. The location of this salt concentration, known as X2, is an indicator of effects on this critical brackish water habitat among the alternatives.

The March 1998 *Phase II Interim Report* provided a summary of analyses with these eighteen distinguishing characteristics. Two key distinguishing characteristics seemed to be particularly important in identifying how well the alternatives perform. **Export Water Quality** and **Diversion Effects on Fisheries**, are highly dependent on the alternative selected. Therefore, irrespective of whether these two characteristics are the most important to selection of the preferred program alternative, they are the characteristics most dependent on that decision.

As mentioned previously, based on assumptions made for evaluations in the March *Phase II Interim Report*, the dual Delta conveyance with an isolated facility appeared to provide greater technical performance than the other alternatives. Since March, CALFED staff have refined

analyses of these eighteen distinguishing characteristics using updated modeling and data. These refined analyses support the earlier conclusion that the dual Delta conveyance with an isolated facility appears to provide greater technical performance than the other alternatives (see Attachment A for a summary of the analyses). At the same time, however, there are still major assurances issues associated with this approach, and CALFED needs to obtain better scientific information before a decision can be made on this alternative. In addition, while the dual Delta conveyance may have technical advantages over other Delta conveyance, it would likely take a decade or more to plan, design, permit, and construct.

To address the assurances, need for better scientific information, and long lead time required for the dual Delta conveyance, CALFED more fully integrated adaptive management throughout the program elements. This led to structuring implementation in stages over time. Each stage begins implementation of certain actions, gathers scientific information to help future decisions on other actions, and provides greater assurances that actions within each stage will move forward together and will be operated as intended. With this approach, a more informed decision on the dual Delta conveyance can be made in the future.

For all of the reasons noted above, the basic strategy of the CALFED Program is develop a through Delta conveyance alternative based on the existing Delta configuration with some modifications. In the event that this basic strategy, when carried out in conjunction with all of the common programs, is unable to meet CALFED program goals for drinking water quality or fishery recovery, CALFED would be warranted in moving forward with the modifications that include construction of an isolated conveyance facility to carry a portion of export water around the Delta to the south Delta export pumps. During Stage 1, CALFED will evaluate any additional information developed in the ongoing monitoring and scientific analysis program, and will consider whether the basic strategy should be modified to include an isolated facility for meeting CALFED Program goals.

Additional technical work is proceeding on drinking water quality and diversion effects on fisheries as summarized in the following two sections. Also, Attachment B contains a summary of sensitivity analyses to show how differing assumptions in several areas may or may not alter CALFED's choice of the preferred program alternative.

### 3.2 Bromide Panel

CALFED analyses indicate the selection of a preferred program alternative can have profound effects on concentrations of bromide in drinking water supplies taken from the Delta. This is true because the Pacific Ocean is a major source of bromide in the system. Bromide is a concern to drinking water purveyors because it is capable of undergoing chemical reactions that produce unwanted and potentially harmful chemical byproducts during disinfection of drinking water.

Because the choice of storage and conveyance alternatives is predicted to have more potential for affecting bromide concentrations than any other actions that have been studied, effects of the alternatives on bromide concentrations was identified as a key feature that will distinguish the selection of a preferred program alternative.

To better understand the significance of bromide in Delta drinking water supplies, CALFED assembled a panel of independent, nationally recognized scientific experts to deliberate and provide relevant recommendations. The panelists were chosen with the collaboration of the members of the water quality technical group, the body of agency staff and stakeholders who provide technical advice and recommendations to the CALFED water quality program. The primary areas of expertise of the panelists included chemistry of disinfection byproduct formation, source control, health effects of disinfection byproducts, water treatment, and drinking water regulation development. The panel met on September 8 and 9, 1998.

*[At the time of this writing, the panel report has not been received and, therefore, no official conclusions can be stated; however, the following points are based on staff observations of the bromide discussion.]*

- Delta waters contain considerably higher bromide concentrations than are typically found in drinking water supplies elsewhere in the nation.
- It is important to address concentrations of organic carbon as well as bromide in Delta waters because both react to produce unwanted chemical byproducts. It is also important to address fecal contamination in source waters since lower levels of pathogen concentrations will allow for less disinfection to provide a microbiologically safe water and thereby easier compliance with future DBP regulations.
- Some water treatment technologies appear promising, and considerable research into such technologies is underway. For example, membrane technology can remove both organic carbon and bromide to a significant degree, in addition to removing infective microorganisms. On the other hand, such technologies currently are expensive, though research may improve the economic outlook.
- The next stage of drinking water regulations for disinfection byproducts is scheduled for the year 2002, which will occur well before a CALFED alternative could be fully implemented. Accordingly, it is desirable to develop a short-term strategy to enable these drinking water regulations to be met by agencies using Delta water.
- Recent research has identified hundreds of chemicals that could result from

drinking water treatment, and whose potential to harm the health of humans is unknown. Of these, a significant number contain bromine. For this reason, it can reasonably be expected that the bromide issue will remain of concern with regard to safe drinking water, and that the regulatory stage scheduled for 2002 will probably not be the last that will be required to protect consumer's health.

- CALFED should be an active participant in the information collection process leading to drinking water regulations for disinfection byproducts.
- Sources of bromide other than the ocean should be further investigated with respect to the potential for source control measures.
- Additional modeling studies need to be performed to predict concentrations of individual disinfection byproduct chemicals that would result from the alternatives, because health effects of these chemicals appear to differ significantly.
- CALFED should evaluate new treatment processes for preventing or removing bromine-containing disinfection byproducts in drinking water.
- CALFED should work with urban agencies using Delta waters to develop common means of measuring and evaluating phenomena related to disinfection byproduct formation. This effort would result in broader capability to learn from, and profit by, the experience of individual agencies.
- CALFED should support efforts to refine the capability to perform and appropriately apply human health risk assessments.
- CALFED should monitor water quality parameters having potential for health concern in the foreseeable future.

### 3.3 Diversion Effects on Fisheries

Direct and indirect effects of the existing state and federal water projects are thought to be important, perhaps critical, factors in the decline and endangerment of some fish species.

Aspects of the current problem include:

- Predation in Clifton Court Forebay; entrainment of fish, eggs, and larvae at the SWP and CVP export pumps (partly due to inadequate fish screen facilities)
- Mortality associated with the need to capture, sort and transport fish to Delta

channels away from the screens

- Adverse flow patterns induced by the transport of Sacramento River water across the Delta for diversion, which affects the migration and spawning of fish species.
- Reductions in habitat quality and availability induced by changes in flow conditions in the system caused by project operations and the north-to-south transport of water across the Delta to the export facilities

There is a fair degree of agreement on the relative magnitude of fish losses due to diversion effects that would occur under the various alternatives. However, there is much less agreement on the role of diversion mortality in controlling population abundance when compared to other stressors such as habitat loss.

The focus for diversion effects on fisheries is on particular estuarine and migratory fish: chinook salmon, delta smelt, splittail, striped bass, steelhead and white catfish. Observations over the last half century indicate that these species are quite vulnerable to having their behavior disrupted by the transport of water from the Sacramento River to the export pumps in the south Delta. For other fish species, diversion effects do not appear to be a major stressor. Delta resident fish such as tule perch and several members of the sunfish family appear relatively invulnerable to being drawn to the export pumps. Fish such as starry flounder and longfin smelt, and other organisms such as bay shrimp, live primarily downstream of the Delta. Although they are potentially affected by changes in the amount of water flowing from the Delta through San Francisco Bay to the ocean, they appear to have little vulnerability to diversion effects of the export pumps.

CALFED has formed interagency/stakeholder groups to address the technical issues related to diversion effects on fisheries. The Diversion Effects on Fish Team (DEFT) was formed February 1998 to evaluate the technical issues related to diversion impacts on fisheries. The NoName Group (NoName) was established in 1994 as part of the Operations Group effort at real-time project management. In June of 1998, NoName was asked by CALFED to recommend water supply and water quality measures that are capable of being implemented within Stage 1 (first 7 years) of the Program.

Because of the long lead time required to plan, design, permit, and construct any major water facility, the existing Delta channels must be used for many years even if CALFED needs to move to a dual Delta conveyance sometime in the future. Therefore, the effort for diversion effects on fisheries focused on developing through-Delta options for fisheries and on determining the risk and potential success of species recovery considering all available actions.

**\*\*\*DEFT recommendations are being revised\*\*\***

The DEFT developed eight programmatic actions to maximize the chances of the through Delta conveyance meeting the CALFED purpose:

- Restore a wide range of depleted habitat types for spawning, rearing, and migrating resident and anadromous fish.
- Manage the volume, durations, and pathways of flow, nutrient inputs, and other factors to assure adequate food supply in the Delta.
- Improve screens, screen unscreened diversions, change diversion locations, and consolidate diversions to improve survival of fish at the point of diversions.
- Change operations to improve survival of fish and to protect and improve food supply.
- Establish appropriate environmental cues to improve survival of migratory fish through the Delta.
- Identify and reduce, eliminate, and/or trap inputs of toxics throughout the watershed to reduce or eliminate toxicity of water and sediment in Delta channels.
- Reduce loadings and mobilization of contaminants and metals to reduce body burdens of contaminants and metals in aquatic organisms as necessary to eliminate human health risks from eating these organisms.
- Manage fishing and associated mortality of wild stocks of Sacramento and San Joaquin salmon.

The DEFT is proceeding with evaluation of benefits, costs and institutional measures of suggested flexible operations. The DEFT and NoName teams are working together to develop a recommended through-Delta alternative that meets all of the CALFED objectives and principles. Of greatest concern is continuing exports from the south Delta and the associated entrainment and salvage of important fish species. To address this concern, both teams agree that a key component for most fish species is to provide new fish screen facilities to reduce direct entrainment and predation. Both teams also agree that fish losses can be reduced by an additional increment with flexible operations of the export pumps aided by more intensive use of real time monitoring. Flexible operations would allow reducing export pumping at times critical to fish and increasing export pumping at other times.



### 3.4 Summary of Response to Comments on Draft Programmatic EIS/EIR

The Draft Programmatic EIS/EIR was released for public review on March 16, 1998. The Program received 1836 individual public comment letters which included 469 speakers at 17 public hearings. Thousands of post cards, form letters and letter writing campaign letters were also received.

The top 5 public issues based on volume of comments have been identified as:

- Water Conservation
- New Facilities
- Agricultural Issues
- Area of Origin/ Water Rights
- Finance/ Beneficiary Pays

Conservation and storage received the largest number of comments. The comments associated with these two topics were generally linked, with those who believe water conservation is the sole solution being opposed to new facilities, and those who believe increased water conservation still will not solve the problem being in support of new facilities. The following summarizes how the Program is responding on each of these issues. For more information on the major concerns within each of these issue areas, and how the Program is responding to them, see Attachment C. CALFED will include a complete response to comment document with the Final Programmatic EIS/EIR in late 1999.

#### Response to Water Conservation Issues

Water conservation is an important part of any Bay-Delta solution. Water conservation alone can not provide a complete and comprehensive solution to the problems facing the Bay-Delta including a degraded Bay-Delta ecosystem, declining water quality, a levee system vulnerable to failure, or the uncertainty of water supplies to meet beneficial uses.

Water conservation, along with water recycling, is at the core of the Water Use Efficiency Program element. In the past two decades, many agricultural and urban water users have made significant improvements in their water use efficiency, and the Program intends to amplify these gains by further expanding the implementation of water use efficiency measures. To stimulate the implementation of these efficiency measures, the Program has proposed that local, state, and federal government agencies provide both financial and technical assistance to water providers and water users. The Program has also recommended reporting mechanisms/processes to track the implementation of water use efficiency measures and to ensure compliance with water use

efficiency targets/objectives.

## Response to New Facility Issues

CALFED's basic strategy for Delta conveyance is to use the existing Delta configuration and channel modifications. Modifications to this through Delta conveyance strategy will only be made after thorough assessment of a variety of factors. For example, a decision to construct an isolated facility will be warranted if, after aggressive implementation of relevant common program elements and improvements to through Delta conveyance, there is still an inability to achieve CALFED goals. Reasons for considering an isolated facility would include a public health necessity for improved drinking water at the source arising from technical or economic infeasibility of meeting standards for safe drinking water through other methods, and/or an inability to achieve fishery recovery with continuing impacts of diversions from the south Delta.

Considering the magnitude of conflicts over available water in California, CALFED believes that it must aggressively evaluate and implement all available water management options to ensure water supply reliability. Therefore, aggressive implementation of water conservation, recycling, and a protective water transfer market are critically important for effective water management. New surface and groundwater storage will be constructed as necessary, considering appropriate implementation of nonstructural programs and demonstrated willingness to pay by potential beneficiaries, to meet CALFED's program goals. During Stage 1, CALFED will evaluate and determine the appropriate mix of these water management tools.

## Response to Agricultural Issues

The CALFED Program could result in the conversion of agricultural land for Program purposes such as ecosystem restoration, improved water supply reliability, and improved levee stability as the Program is implemented over the next 25 to 30 years. The Program intends to minimize the conversion of farmland, including prime and unique farmland, to the extent possible. CALFED is proposing to adopt several implementation policies that will minimize the adverse impacts to agricultural land and water resources. They include :

- Maintaining land in private ownership to the greatest extent practicable
- Prioritizing use of existing government owned lands for habitat restoration
- Working with local landowners and organizations to develop projects that meet CALFED objectives while also benefitting local landowners.

Agricultural water users throughout the state will benefit from various program elements. The objective of the Water Quality Program is to improve water quality for all beneficial uses of the Bay-Delta. The Long-Term Levee Protection Plan will bolster and maintain the Delta levees that

protect important agricultural resources, infrastructure, habitat and water quality. The Water Use Efficiency Program will provide planning, technical, and financial assistance to agricultural water users to implement water use efficiency measures, which will help reduce agricultural water costs. The Water Transfers Program will facilitate water transfers; agricultural water users can generate transferable water by implementing water use efficiency measures. New storage facilities could benefit agricultural water users by providing increased flood protection, increased water supply, and groundwater recharge. By recovering healthy populations of endangered or threatened species, the Ecosystem Restoration Program will help improve water supply reliability.

### **Response to Area of Origin/Water Rights Issues**

The CALFED Bay-Delta Program is not proposing to change water rights law in California. Altering the state's system of water rights is beyond the mandate of the CALFED Bay-Delta Program, and the Program will operate within the system of existing water rights including existing laws and regulations protecting areas of origin. Although the State Water Resources Control Board is one of the CALFED agencies working to develop a long-term Bay-Delta solution, the Board retains its independent regulatory authority over water rights and water quality protection in California. The Board is engaged in water right hearings concerning the allocation of responsibilities to water right holders for meeting Bay-Delta water quality standards.

The CALFED Bay-Delta Program is designed to address a wide variety of problems and concerns affecting the Bay-Delta system. While it focuses on the Delta region, it has the potential for affecting land use throughout the vast solution area. CALFED seeks to accomplish its objectives in partnership with landowners, stakeholders, and communities throughout the solution area, being especially mindful of the potential impacts on private property owners and existing landowner rights.

### **Response to Finance/Beneficiary Pays Issues**

CALFED will use a benefits-based approach to allocate the costs of the program. Simply put, those who benefit from the program will pay for their fair share of it. This means that a combination of both public and user funds will be needed. Many of the proposed program actions serve multiple benefits, including public benefits. These could include protection of key Delta functions including agriculture and levee system integrity, conveyance and ecosystem restoration.

CALFED has developed a cost draft financing plan, which is included with this report. It includes financial strategies which could be implemented in Phase III. A complete financial

strategy for Stage 1 will be available at the time of the Record of Decision.

### 3.5 Staged Implementation and Staged Decision Making

The complexity of the Bay-Delta system and the inability to predict future events and how the system will respond to management actions requires that an adaptive management philosophy and process be employed for every program element.

CALFED has decided to implement the Program through stages. The preferred program alternative is composed of hundreds of individual actions that will be implemented and refined over the 20 to 30 year implementation period. Therefore, it is logical to implement the Program in stages according to major program milestones. The challenge in implementing the Program in stages is to allow actions that are ready to be taken immediately to go forward, while assuring that everyone has a stake in the successful completion of each stage.

Like implementation, the decision process will be staged to allow better decisions in adaptive management at the appropriate time. The programmatic nature of the EIS/EIR provides the general direction for long-term implementation but not the specific information necessary for every decision required during the 20-30 year implementation period. Not all decisions need to, or can, be made at the outset of implementation. Therefore, stages will be identified where there are logical implementation milestones and decision making points. In this way, adaptive management can be applied equally well to a series of incremental actions such as ecosystem restoration or for major single decision projects such as surface storage or conveyance.

Staged implementation for the CALFED preferred program alternative involves identifying certain actions for implementation for which there is general

#### Staged Implementation

- Identify certain actions at the outset (for all stages).
- Identify possible actions for future stages with associated conditions and linkages to guide the decisions. This will allow some decisions when more scientific information will be available and the effects of previous actions will be better known.
- Stage assurances that include specific agreements among agencies and stakeholders

#### Conditional Decision

For those areas of the Program where important linkages exist, the decision to proceed will be guided by a carefully crafted set of predefined conditions. Conditional decisions guided by the conditions and linkages will facilitate adaptive management.

agreement and justification, and also developing conditions for future decisions and for moving beyond Stage 1. For some actions, certain predefined conditions would need to be met before actions could proceed. For example, certain conditions would be linked to the decision to construct major facilities. **Conditional decisions** on several program elements may be required at each stage of implementation. These require assurances that certain linkages, such as performance measures for each program element, are satisfied before making a decision to proceed.

The first stage begins a series of actions that will ultimately form the CALFED solution. Rather than leading directly to a specific, predefined outcome, the first stage initiates a process where the outcome is dependent on the results of adaptive management and future conditional decisions. In this way, the first stage could lead to a number of different outcomes with decisions made and implemented most intelligently based on real world experiences and data. As a result, the most cost-effective and environmentally sound actions can be implemented. The Stage 1 actions will be carefully selected to minimize the potential for spending money on improvements that would not be useful with the range of future implementation actions. At the same time, CALFED recognizes the need for adaptive management and that some Stage 1 actions may need to be refined as better information becomes available in the future.

In order to succeed Stage 1 must:

- Result in overall improvement for all resource areas for the Bay-Delta system.
- Provide stability in the water resources management framework until actions in subsequent stages substantively reduce conflicts in the system.
- Improve conditions in the Bay-Delta system for listed and proposed species. These actions can provide for species protection and begin the process of recovery.
- Have a mix of public and private funds based on "beneficiary pays" principle.
- Build the information base for the transition to Stage 2.
- Address the conditions and linkages (assurances) necessary before proceeding with storage and conveyance.
- Include an ongoing public process or information dissemination and input to the decision making and adaptive management process.
- Complete implementation plans to finish Stage 1 and to move to subsequent stages for each program element:
  - Refine implementation plan for the long-term levee protection plan
  - Refine implementation plan for the water quality program
  - Refine implementation plan for the ecosystem restoration program
  - Refine implementation plan for the water use efficiency program, water transfer program, and storage as a bundle to meet CALFED water supply reliability goals.
  - Refine implementation plan for watershed program

- Refine implementation plan for conveyance

CALFED will continue work between the Revised Draft EIS/EIR and the Final EIS/EIR in late 1999 on grouping the Stage 1 actions into a series of bundles (packages) which can provide additional assurances for balancing benefits. For example, a bundle of actions in the Delta could include levee work, habitat improvements, water quality work, and facilities and operations to improve water supply reliability. Bundles for some actions may be geographical, based on timing, or other grouping. Linking the actions would assure that they all move forward together. These may be linked within the same site specific EIS/EIR, tied by contractual documents, dependent on the same funding, or other means.

Discussion is continuing on conditions and linkages for a draft preferred program alternative. There are many potential linkages (many are assurance issues) among the various actions in the draft preferred alternative, which includes common program elements, storage, and conveyance. Future conditional decisions can be made depending on how the conditions and linkages are satisfied.

There is generally broad agreement on proceeding with the program elements for water quality, water use efficiency, ecosystem restoration, levee system integrity, water transfer framework and the watershed program, but only if implementation is linked to reasonable progress in all program elements. However, there is not agreement on the need for surface storage and dual Delta conveyance (with isolated facility) to achieve the CALFED purpose.

Meeting the CALFED mission statement and goals is dependent on improvement in all problem areas (ecosystem, water quality, levee system integrity, and water supply reliability). Linkages between improvement in the problem areas are key to consistent and continuous progress towards meeting the CALFED purposes. The eight program elements and linkages between the elements are the mechanisms to achieve improvement in the four problem areas.



## 4. DRAFT PREFERRED PROGRAM ALTERNATIVE

The description of the alternative is programmatic in nature, intended to help agencies and the public make decisions on the broad methods to meet Program purposes. The alternative is not intended to define the site specific actions that will ultimately be implemented. See Chapter 5 Implementation Plan for more specific Stage 1 actions.

The preferred program alternative for the CALFED solution is assembled from hundreds of programmatic actions. To help organize the discussion of the alternative, the actions are grouped under each of the eight program elements summarized below. These will be implemented in stages utilizing adaptive management over the next 30 years:

- **Long-Term Levee Protection Plan** - Provides significant improvements in the reliability of the Delta levees to benefit all users of Delta water and land.
- **Water Quality Program** - Makes significant reductions in point and non-point pollution for the benefit of all water uses and the Bay-Delta ecosystem.
- **Ecosystem Restoration Program** - Provides significant improvements in habitat, restoration of some critical flows, and reduces conflict with other Bay-Delta system resources.
- **Water Use Efficiency Program** - Provides support and incentives at the local level through expanded planning, technical, and financial assistance for efficient use of water for agricultural, urban, and environmental purposes.
- **Water Transfer Program** - Provides a framework of actions, policies and processes to facilitate, encourage, and streamline an active yet protective water market which will allow water to move between users, including environmental uses, on a voluntary and compensated basis.
- **Watershed Program** - Promotes locally-led watershed management activities and protections relevant to achieving the CALFED purpose through financial and technical assistance.
- **Storage** - Recognizes potential water supply and environmental benefits of new or expanded groundwater and surface storage. New storage will be included in the preferred program alternative as necessary to meet CALFED's goals, considering appropriate implementation of nonstructural programs and demonstrated willingness to pay by potential beneficiaries. During Stage 1,



CALFED will evaluate and determine the appropriate mix of these water management tools.

- **Delta Conveyance** - Provides a basic strategy for using through Delta channels to meet CALFED purposes. Modifications to this through Delta conveyance strategy will only be made after thorough assessment of a variety of factors. For example, inability to meet CALFED program goals for drinking water quality or fishery recovery using the basic strategy would warrant making a decision to move forward with modifications to this strategy including an isolated facility to carry a portion of export water around the Delta.

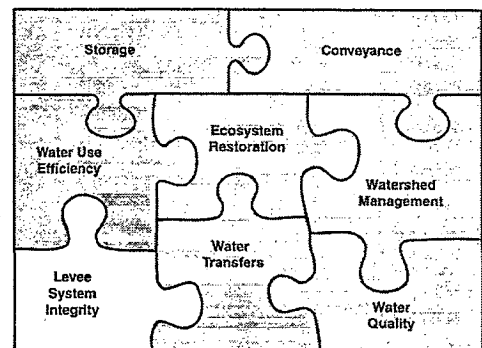
All of these will employ an adaptive management approach with careful monitoring of performance to help modify (adapt) future actions as more is learned about the system and how it responds. The implementation of the preferred program alternative is supported by an Assurances Plan, Financing Plan, and a Comprehensive Monitoring, Assessment and Research Program.

## 4.1 Program Elements

Meeting the CALFED purpose is dependent on improvement in all four problem areas (ecosystem, water quality, levee system integrity, and water supply reliability). The eight program elements and linkages between the elements are the mechanisms to achieve improvement in the problem areas.

### Long-Term Levee Protection Plan

The Sacramento-San Joaquin Delta is an area of great regional and national importance, which provides a broad array of benefits including agriculture, water supply, transportation, navigation, recreation and fish and wildlife habitat. Delta levees are the most visible man-made features of this system. Historically, the levee system has been viewed as a means of protecting other resources. However, levees are an integral part of the Delta landscape and are key to preserving the Delta's physical characteristics and processes including definition of the Delta waterways and islands.



Given the numerous public benefits protected by Delta levees, the focus of the Long-Term Levee

Protection Plan is to improve levee stability. The plan will build on the successes of existing programs in achieving its goals. There are five main parts to the levee protection plan:

**1. Base-Level Protection Plan** - Base-level funding provides equitably distributed funding to participating local agencies in the Delta. One of the primary goals of the CALFED Program is to reconstruct all Delta levees to a particular standard. CALFED has tentatively selected the U.S. Army Corps of Engineers PL 84-99 standard. This component will seek continuity with and build on the successes of the Delta Levee Subventions Program which is currently administered by DWR.

**2. Special Improvement Projects** - The special improvement project funding continues a funding mechanism for special habitat improvement and levee stabilization projects to augment the base-level funding at the discretion of the program manager, within specific policy guidelines. Under the special improvement projects, flood protection would be enhanced for key islands that provide statewide benefits to the ecosystem, water supply, water quality, economy, and the infrastructure. Special improvement project funding is based on the benefit to the public, not solely on the need for improvement. This component will seek continuity with and build on the successes of the Special Flood Control Protections Program which is currently administered by DWR.

**3. Delta Island Subsidence Control Plan** - Subsidence has played a key role in bringing the Delta islands to where they are today; relatively tall levees protecting interiors below sea-level. The Levee Program will promote land management and levee maintenance practices to reduce subsidence that affects the levee system. Subsidence control measures will be implemented through the Special Projects component of the Levee Program and supplemented by research to develop BMPs through grants.

**4. Emergency Management Plan** - The most recognizable threat to Delta islands and resources in the Delta is inundation due to winter flood events. In addition, other potential disasters can be caused by high tides and high winds, earthquakes, burrowing animals whose actions can cause levees to fail, toxic spills, failure of Delta levees during low flow periods, and fire. Approximately 20 islands have flooded since the 1960s, including repeated flooding of some islands. The emergency management plan will build upon existing state, federal, and local agency emergency management programs to improve protection of Delta resources in the event of a disaster.

**5. Seismic Risk Assessment** - Earthquakes can cause levees to fail by slumping or liquefaction of underlying soils. To date, there have been no known Delta island inundations as a result of seismic events. However, there are several active faults located sufficiently close to the Delta to present a threat to Delta levees. The seismic risk assessment will continue to refine the evaluation of the potential performance of the existing levee system during seismic events as well as explore risk reduction strategies.

Delta channel modifications for conveyance may require setback levees along the alignment or a different levee cross section depending on channel flows and velocities. The levee cross sections in places may vary depending on locations selected for levee-associated habitat.

Overall benefits of the Delta Long-Term Levee Protection Plan include:

- Funding for continued maintenance of levees to protect Delta functions
- Suitable funding, equipment and materials availability, and coordination to rapidly respond to levee failures
- Subsidence reduction helps long-term Delta system integrity
- Increased reliability for water supply needs from the Delta and in-Delta water quality
- Increased reliability for in-Delta land use
- Increased reliability for in-Delta aquatic and wildlife habitat

#### **Long-Term Levee Protection Plan**

##### **Facts and Figures**

- Helps protect land uses, water quality, and water supply reliability.
- Provides new opportunities for habitat.
- Meets Program objectives for reducing vulnerability to the Delta system. However, seismic risk is uncertain.
- Requires additional research on seismic vulnerability.
- Could exceed \$ 1 billion over 20-30 years or more. Annual investment rates may exceed \$30 to \$35 million.

More information on the levee program will be included in the revised *Long-Term Levee Protection Plan*.

Work is continuing on the following issues:

**Subsidence** - There is a lack of concurrence on the extent that subsidence affects levee integrity. The various positions on subsidence impacts to levee integrity are presented in the Long Term Levee Protection Plan. The Subsidence Sub-Team will continue to meet regularly until this issue is resolved. The goal is to reach a consensus opinion on the issue by the time the final draft Long Term Levee Protection Plan is issued with the Final Programmatic EIS/EIR in late 1999.

**Suisun Marsh Levees** - CALFED is investigating the merits of including the Suisun Marsh levee system in the Levee Program. At this point, the following two options are being considered:

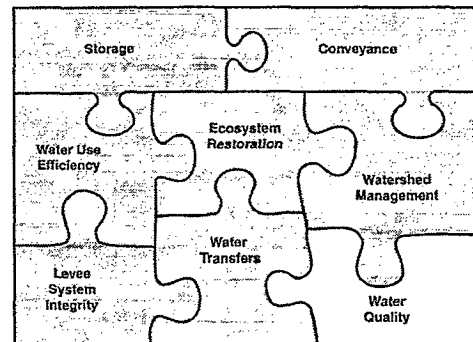
1. Include the exterior levees (approximately 230 miles) into CALFED's Levee Program. The existing "Suisun Marsh Exterior Levee Standard" would be adopted.
2. Reconfigure the Marsh to protect existing managed wetlands and develop new tidal wetlands. Some landowners have expressed opposition to this alternative because it would affect their current land use.

In 1999, CALFED staff will further develop these two options by completing the following tasks:

- Get additional stakeholder (including local landowners) input
- Develop various Marsh configurations to study
- Quantify benefits
- Perform two-dimensional system modeling on various Marsh configurations to determine how they affect water quality in the marsh and in the Delta
- Quantify Ecosystem Restoration Plan linkages
- Develop feasibility level cost estimates
- Document results in the Long-Term Levee Protection Plan (The potential impacts of including the Suisun Marsh levee system into the Levee Program are documented in the Draft Programmatic EIS/EIR)
- Develop alternative funding sources

## Water Quality Program

The draft Water Quality Program includes programmatic actions to further the Program's goal of providing good water quality for environmental, agricultural, drinking water, industrial, and recreational beneficial uses of water. While some actions are sufficiently developed for early implementation, others rely on comprehensive monitoring and future research to improve our understanding of effective water quality management and to control water quality problems at their sources.



Determining impairment to a water quality beneficial use is often difficult and complicated. For some beneficial uses, such as drinking water and agricultural water use, impacts on use are generally well characterized. For other beneficial uses such as ecosystem use, impacts on species are not as well characterized. The Program has relied on the technical expertise of a variety of stakeholders to define approaches to solving water quality problems. The Water Quality Program actions include a combination of research, pilot studies, and targeted activities. This approach allows actions to be taken on known water quality problems and sources of those

problems, while allowing further monitoring and research of potential problems and solutions. Actions will be adapted over time to ensure the most effective use of resources.

In summary, the draft Water Quality Program component includes the following broad categories of programmatic actions:

- **Drinking Water** - Increase source water quality and treatment technology to reduce potentially toxic and carcinogenic disinfection by-products by controlling total organic carbon (TOC), pathogens (controlling inputs from rangelands, dairies, and confined animal facilities), turbidity, and bromides. The quality of drinking water supplies taken from the Delta will be improved.
- Further research is needed for some water quality problems.**

For example, for some parameters of concern, such as mercury, not enough is understood about its sources, the bioavailability of mercury to various species, factors contributing to its bioavailability, and the load reductions needed to reduce fish tissue concentrations necessary for human consumption.
- **Pesticides** - Reduce impacts of pesticides through development and implementation of Best Management Practices, for both urban and agricultural uses, and support of pesticide studies and pilot projects for regulatory agencies while providing education and assistance in implementation of control strategies for the regulated pesticide users.
  - **Organochlorine pesticides** - Reduce the load of organochlorine pesticides in the system, including residual DDT and Chlordane, by reducing runoff and erosion from agricultural lands through Best Management Practices. Sediment control will also protect valuable topsoil and prevent costly maintenance of drainage systems.
  - **Trace Metals** - Reduce impacts of trace metals such as copper, cadmium, and zinc in upper watershed areas, near abandoned mine sites. Reduce impacts of copper through urban stormwater programs and agricultural Best Management Practices. Study the ecological impacts of copper in the Delta. Determine the feasibility of copper reduction.
  - **Mercury** - Reduce mercury in rivers and the estuary by source control at inactive and abandoned mine sites. Also, study bioavailable mercury in the rivers and the estuary and its potential threat to human health.
  - **Salinity** - Reduce salinity through reduction of leaching of agricultural land via irrigation improvement, crop selection and changes in land use. Reduce imports

of salt and study non-agricultural source contributions. Salinity reductions in the river would also incorporate real-time management of salt discharges. San Joaquin drainage problems have been evaluated in several studies over the past two decades. Complete resolution of the San Joaquin drainage problems is beyond the scope of the CALFED Bay-Delta Program.

- **Selenium** - Reduce selenium, through irrigation control, crop selection, and possibly land fallowing or land retirement. Impacts of selenium will be further reduced by real-time management of selenium laden agricultural drain water released to the San Joaquin River to minimize concentrations in the river when selenium discharges occur.
- **Turbidity and Sedimentation** - Reduce turbidity and sedimentation which affect several hydraulic areas in the Bay Delta and its tributaries, including treatment of drinking water sources. Study ecological impacts of sedimentation. Control sedimentation in several watersheds to protect spawning beds and maintain capacity of streams.
- **Low Dissolved oxygen** - Reduce impairment of rivers and the estuary caused by substances that exert excessive demand on dissolved oxygen. Oxygen depleting substances are found in waste discharges, agricultural discharges, urban stormwater, sediment, and algae.
- **Toxicity of Unknown Origin** - Through research and monitoring, identify parameters of concern in the water and sediment within the Delta, Bay, Sacramento River and San Joaquin River regions and implement actions to reduce their toxicity to aquatic organisms.

An analysis of bromide and organic carbon sources in Delta drinking water supplies was undertaken to develop a realistic expectation of what level of reductions in bromide and organic carbon concentrations might be expected as a result of Water Quality Program actions. This analysis indicates that the Pacific Ocean and the San Joaquin River are the most important sources of bromide in Delta waters. Further analysis of the San Joaquin River indicated that about 80% of the bromide found there can be accounted for by bromide entering the Delta through the Central Valley Project pumps at Tracy. Evidence suggests that other sources of

#### **Water Quality Program** **Facts and Figures**

- Provides critically needed reduction of toxics for fisheries and an important reduction in organic carbon to improve drinking water.
- Does not completely address health concerns associated with bromide without other Program elements.
- Could exceed \$0.75 billion over 20-30 years. May require annual investment exceeding \$30 million.

bromide, such as pesticide use in the Valley or natural sources in San Luis Reservoir are not as important; therefore, it appears that a large majority of bromide found in the San Joaquin River is from recirculated Delta water containing bromide from the ocean. This bromide analysis indicates that, because bromide in Delta drinking water supplies comes mostly from the ocean, it is probably not possible for water quality actions to reduce bromide concentrations by more than 20% at best.

Water flowing through the Delta to municipal water intakes picks up organic carbon. Studies have demonstrated that a majority of this added carbon comes from drainage off Delta islands. Organic carbon, unlike bromide, is subject to removal, at least to some extent, through conventional water treatment processes. While a number of practical problems would affect the feasibility and economics of reducing organic carbon to acceptable levels, it appears to be at least theoretically feasible to meet this objective through water quality program actions involving land and water management and treatment either on Delta islands or at treatment plants.

Further studies will be required to more fully quantify the results of potential water quality actions, and to establish the feasibility of implementing these actions.

Storage can help timing for release of pollutants remaining after source control efforts. Improved conveyance to south Delta export pumps will improve water quality for those diversions but may decrease quality for in-Delta diversions. Water use efficiency measures can improve water quality entering the Delta by reducing some agricultural and non-agricultural discharges containing pollutants. Wastewater reuse depends on high quality water to prevent salt damage of irrigated land or corrosion of industrial equipment.

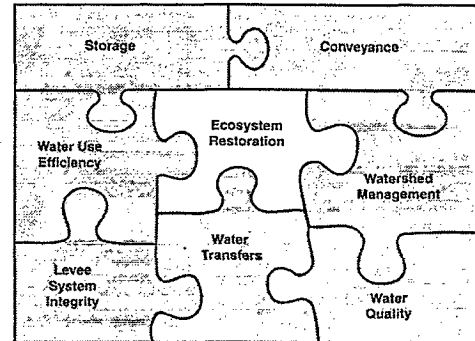
Potential benefits of the Water Quality Program include:

- Improves Delta water quality by reducing the volume of urban and agricultural runoff/drainage and concentration of pollutants entering the Delta
- Improves water quality for the ecosystem by reducing toxicants as a limiting factor
- Improves drinking water quality and public health benefits
- Reduces concentration of compounds contributing to disinfection byproduct formation potential and degradation of drinking water supplies
- Improves the potential for wastewater reclamation to improve water use efficiency.

More information on the water quality program will be included in the revised *Water Quality Program Plan*.

## Ecosystem Restoration Program

The Ecosystem Restoration Program (ERP) is the principal mechanism that CALFED will use to restore the health of the Bay-Delta ecosystem. The overarching goal of the ERP is to improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species. The ERP is composed of three volumes: Volume I contains vision statements that describe the ecological attributes and desired future Bay-Delta conditions; Volume II outlines over 700 programmatic restoration actions for the 14 ecological management zones delineated within the Bay-Delta ecosystem; and the Strategic Plan describes the ecosystem-based, adaptive management approach that will be used to implement the restoration program.



The ERP is predicated upon an ecosystem-based management approach that emphasizes the restoration of ecological processes. By restoring the natural processes that create and maintain diverse and vital habitats, the ERP aims to meet the needs of multiple plant and animal species while reducing the amount of human intervention required to maintain habitats. Through this ecosystem-based approach, the ERP will contribute to or assist in the recovery of endangered and threatened species that use the Bay-Delta, and it will help improve the population abundance and distribution of unlisted plant and animal species, thereby reducing or precluding future species listings. In this manner, the ERP will help reduce conflicts between endangered and threatened species and water supply opportunities.

Because the Bay-Delta ecosystem is large, complex, diverse and variable, it is impossible to know with certainty how it will respond to implementation of the ERP and other Program components. Although we know much about how the Bay-Delta functions, there are still significant information gaps that hamper our ability to sufficiently define problems and design restoration actions to address them. To account for this uncertainty, the ERP uses an adaptive management approach to restoring and managing the Bay-Delta ecosystem. In an adaptive management approach, restoration actions are designed and monitored so that they improve our understanding of the system while simultaneously restoring it. This approach allows revision of restoration activities or better design future restoration actions based upon the information gathered from projects implemented earlier. It also provides the flexibility required to respond to changing Bay-Delta conditions and to identify and address resource conflicts and trade-offs. The Strategic Plan outlines the following steps as part of the adaptive management approach:

- Define the problem or set of problems to be addressed
- Define goals and objectives for resolving identified problems
- Develop conceptual models



- Develop and design alternative restoration or management actions
- Implement restoration actions
- Monitor the ecosystem
- Update restoration and management actions

CALFED will use this adaptive management process to refine and implement the 700 programmatic restoration actions contained in the ERP. Representative ERP actions include:

- Restoring, protecting, and managing diverse habitat types, including representative native habitat communities.
- Restoring critical instream and channel-forming flows in Bay-Delta tributaries.
- Improving Delta outflow during key springtime periods.
- Reconnecting Bay-Delta tributaries with their floodplains through the construction of setback levees, the acquisition of flood easements, and the construction and expansion of flood bypasses.
- Developing prevention and control programs for invasive species.
- Restoring aspects of the sediment regime by relocating instream and floodplain gravel mining, and by artificially introducing gravels to compensate for sediment trapped by dams.
- Reducing or eliminating fish passage barriers, including the removal of dams, construction of fish ladders, and construction of best available technology fish screens.
- Targeting research to provide information needed to define problems sufficiently and to design and prioritize restoration actions.

More information on the ecosystem restoration program will be included in the revised *Ecosystem Restoration Program Plan*.

CALFED seeks to preserve as much agricultural land as possible during implementation in Phase III consistent with meeting all Program goals. Some of land needed for Program implementation is already owned by the government and that land will be used when appropriate. Partnerships with landowners, including easements, will be pursued when appropriate to obtain mutual benefit if the appropriate government land is not available. Acquisition of fee title to land will be used when neither available government land nor partnerships are appropriate or cost effective for the

specific need.

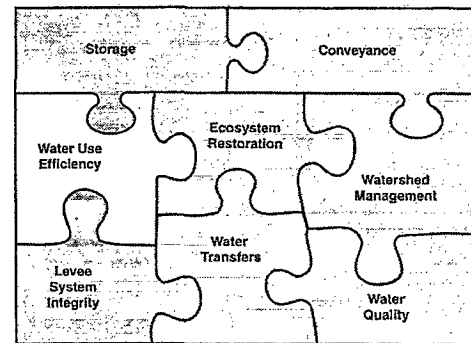
Agriculture resources are an important feature of the existing environment of the state and are recognized and protected under CEQA and state policy. One of the major principles of the State's environmental agricultural policy is to sustain the long-term productivity of the State's agriculture by conserving and protecting the soil, water, and air which are agriculture's basic resources. It is CALFED policy that adverse environmental effects to agricultural resources resulting from CALFED programs, projects, and actions will be fully assessed and disclosed under CEQA, and avoided or mitigated as required by CEQA. Assessment, disclosure, and avoidance and other mitigation strategies shall be developed at the programmatic and project-specific levels in consultation with other state, federal, and local agencies with special expertise or authority over agricultural resources which may be affected by the Program, such as California Department of Food and Agriculture.

CALFED agencies have committed, through the July 1994 Framework Agreement, to promote maximum coordination, communication, and cooperation among themselves. CALFED agencies have also agreed that coordination shall not constrain or limit the agencies in carrying out their statutory responsibilities. Numerous activities and programs are ongoing or proposed that convert agricultural land to habitat for fish, wildlife, and wetland purposes. Examples are actions being taken through the Central Valley Project Improvement Act and the Central Valley Habitat Joint Venture to protect and restore significant areas of land in the Central Valley. To the extent that these activities and programs establish habitat that is proposed in the ecosystem restoration program, that habitat reduces the amount of habitat that is needed to achieve the ecosystem restoration program goals. Also, to the extent that these activities and programs propose water acquisition that is proposed in the ecosystem restoration program, that water reduces the amount of water that is needed to achieve the ecosystem restoration program goals.

Several entities have expressed concern that CALFED is not directly focusing on promoting the health of San Francisco Bay, particularly the Central and South Bay areas. It is true that the Program has not included San Francisco Bay as part of its defined problem area (which includes the legally defined Delta, Suisun Bay extending to Carquinez Strait, and Suisun Marsh). Nevertheless, because the Bay-Delta system is part of a larger water and biological resource system, solutions to address the problems in the system will include a broader geographic scope extending both upstream and downstream. This solution scope includes San Pablo Bay, San Francisco Bay, and portions of the Pacific Ocean out to the Farallon Islands. In particular, the Program will address interactions between the Delta and San Francisco Bay, such as flow or sediment, by examining the "inputs" and "outputs" from the defined problem area. In addition, given CALFED's solution principle that solutions should have no significant redirected impacts, consideration needs to be given to how each alternative might negatively affect San Francisco Bay. The Draft Programmatic EIS/EIR evaluates impacts (both adverse and beneficial) of the CALFED alternatives on the San Francisco Bay region.

## Water Use Efficiency Program

The CALFED Water Use Efficiency Program is based on the recognition that implementation of efficiency measures occurs mostly at the local and regional level. The CALFED policy toward water use efficiency is a reflection of the State of California legal requirements for reasonable and beneficial use of water: existing water supplies must be used efficiently, any new water supplies that are developed by the Program must be used efficiently as well.



The role of CALFED agencies in Water Use Efficiency will be to offer support and incentives through expanded programs to provide planning, technical, and financial assistance. CALFED agencies will also support institutional arrangements that give local water suppliers an opportunity to demonstrate that cost-effective efficiency measures are being implemented. Some potential water use efficiency benefits, such as water quality improvements, may be regional or statewide rather than local. These are situations in which CALFED planning and cost-share support may be particularly effective.

Based on analysis provided in the *Water Use Efficiency Program Plan*, estimates of potential water conservation and water recycling are summarized in the following table. Values represent water savings expected to occur for future conditions regardless of the outcome of a CALFED solution (termed no-action) as well as the incremental savings expected from a CALFED solution. Representative values shown in this summary table are all midpoints in value ranges contained in the *Revised Water Use Efficiency Program Plan*.

**Summary of Estimated Conservation and Recycling Potential (1,000 acre-feet)**

	No Action (in absence of CALFED )		CALFED Increment (result of CALFED actions)		Total Conservation Potential	
	Conservation Potential	Irrecoverable Loss Savings	Conservation Potential	Irrecoverable Loss Savings	Conservation Potential	Irrecoverable Loss Savings
Urban	1160	685	1280	845	2440	1530
Agricultural	2390	228	1816	148	4206	376
Urban Recycling	9671	7981	340	255	1177	974
Total	4517	1711	3436	1248	7953	2959

1. No Action recycling values do not include existing recycling level of 485,000 acre-feet (the March 1998 *Phase II Interim Report* inadvertently included the existing values).

With respect to urban and agricultural water conservation, CALFED proposes to rely largely on locally-directed processes to provide endorsement or certification of urban and agricultural water suppliers that are properly analyzing conservation measures and are implementing all measures that are cost-effective and feasible. Organizations composed of water suppliers and public interest or environmental groups already exist that may be able to serve this function. Endorsement or certification of water suppliers will enable CALFED agencies to target assistance programs and other measures to assure efficient water use.

The draft Water Use Efficiency Program includes the following actions.

Water conservation related actions include:

- Work with the California Urban Water Conservation Council and the Agricultural Water Management Council to identify appropriate urban and agricultural water conservation measures, set appropriate levels of effort, and certify or endorse water suppliers that are implementing cost-effective feasible measures.
- Expand state and federal programs to provide sharply increased levels of planning, technical, and financing assistance and develop new ways of providing assistance in the most effective manner.
- Help urban water suppliers comply with the Urban Water Management Planning Act.
- Help water suppliers and water users identify and implement water management measures that can yield multiple benefits including improved water quality and reduced ecosystem impacts.
- Identify and implement practices to improve water management on wildlife refuges.
- Gather better information on water use, identify opportunities to improve water use efficiency, and measure the effectiveness of conservation practices.

Water recycling actions include:

- Help local and regional agencies comply with the water recycling provisions in the Urban Water Management Planning Act.
- Expand state and federal recycling programs in order to provide sharply increased levels of planning, technical, and financing assistance, and develop new ways of providing assistance in the most effective manner.

- Provide regional planning assistance that can increase opportunities for use of recycled water.

Assurances will play a critical role in the Water Use Efficiency Program element. The assurance mechanisms are structured to ensure that urban and agricultural water users implement the appropriate efficiency measures. As a prerequisite to obtaining CALFED Program benefits (receiving "new" water, participating as a buyer or seller in a water transfer, receiving water from a drought water bank) water suppliers will need to show that they are in compliance with the applicable urban or agricultural council agreements and applicable State law. This requirement will result in careful analysis and implementation of cost-effective conservation measures identified in those agreements.

A high level of water use efficiency is also expected to be required as a condition for permitting of any new surface storage projects. Widespread demonstration of efficient use by local water suppliers and irrigation districts will be a prerequisite to CALFED implementation of new storage projects. Regulatory requirements are described more fully elsewhere in this document.

Some assurances of water use efficiency are yet to be refined or fully developed. There is little stakeholder consensus surrounding the role of the Agricultural Water Management Council (AWMC) as the entity to assure a high level of water use efficiency in the agricultural sector. A related issue concerns the way water deliveries are measured and priced: CALFED is considering a requirement that recipients of "new" or transferred water meet water measurement and volumetric pricing requirements developed under the Central Valley Project Improvement Act (CVPIA), but this would conflict with the policies of the AWMC. There is also uncertainty regarding assurances of water recycling. At the request of stakeholders, CALFED will explore incentives to encourage increased levels of water recycling.

Local water suppliers will rely on CALFED agencies to provide a high level of technical assistance and planning assistance to support local conservation and recycling efforts. Adequate funding for assistance programs will be an important assurance for local agencies. Initial estimates suggest a need for \$30 million per year during Stage 1 implementation for CALFED agencies to carry out adequate assistance programs.

Economic analyses are underway that will compare water use efficiency options (including conservation, recycling, and transfers) and new facilities and identify least-cost ways of meeting CALFED objectives. These analyses are expected to better define the mix of demand management options and water supplies from new facilities. CALFED will work with stakeholders on technical and implementation issues as these analyses proceed.

The effectiveness of water use efficiency measures can be enhanced by other program actions. For example, the groundwater banking and conjunctive use programs in Delta export areas such

as the San Joaquin Valley and the Tulare Lake Basin and in the Sacramento Valley could enable water users to bank conserved water for use in times of shortage. The extent of feasible water recycling is affected by efforts to maintain and improve water quality. Source water that is high in salinity may not be suitable for subsequent recycling.

Potential benefits of the water use efficiency program include:

- Reduces demand for Delta exports and reduces related entrainment effects on fisheries
- Can help in timing of diversions which can reduce entrainment effects on fisheries
- Could make water available for transfers to water users and for environmental flows
- May improve overall Delta and tributary water quality
- Could reduce the total salt load to the San Joaquin Valley

More information on the water use efficiency program will be included in the revised *Water Use Efficiency Program Plan*.

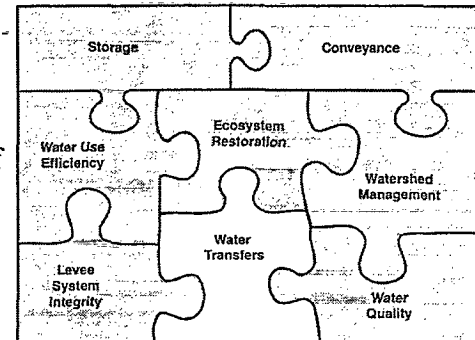
Work is continuing on the following issue:

**Agricultural Water Use Efficiency Assurances** - In the March 1998 draft EIS/EIR, CALFED proposed that a stakeholder group, Agricultural Water Management Council, serve as a forum for demonstration of efficient water use in the agricultural sector. There has been dissatisfaction with this proposal. In response, CALFED will convene an informal focus group of stakeholders and agency representatives that can offer guidance for further refinement of the agricultural water use efficiency program. In acting on guidance received, CALFED will proceed with program refinement in an open public process.

The ultimate goal for CALFED is to develop agricultural water use efficiency assurances that are acceptable to major stakeholder groups and CALFED agencies. This might include an approach that has a high likelihood of identifying opportunities for efficiency improvements and implementing those that are cost-effective and beneficial, yet does not compel water users to implement measures that are not cost-effective for them or are not reasonable under particular local conditions.

## Water Transfer Program

Water transfers are currently an important part of water management in California and offer the potential to play an even more significant role in the future. Transfers can provide an effective means of moving water between users on a voluntary and compensated basis, as well as a means of providing incentives for water users to implement management practices which will improve the effectiveness of local water management.



Every year, hundreds of thousands of acre-feet of water are transferred between willing parties. Most of these transfers consist of in-basin exchanges or sales of water among Central Valley Project (CVP) or State Water Project (SWP) contractors. For example, in 1997 nearly 288,000 acre-feet of CVP water was transferred by CVP contractors south of the Delta. Of this amount, approximately 76,000 acre-feet was transferred to meet the San Joaquin Valley Level IV refuge water needs, as required by CVPIA. Since 1993, over 1.4 million acre-feet of CVP water has been transferred north and south of the Delta by contractors within the various divisions of the CVP. In addition, 230,000 acre-feet of non-CVP water has been purchased and transferred by the Interior Water Acquisition Program to meet established instream flow purposes.

Generally, past transfers have been successful, but they have raised concerns regarding adverse impacts to other water users, to rural community economies and to the environment. They have also highlighted contradictory interpretations of state law, the lack of reliable ways to transport the transferred water across the Delta, and complicated approval processes. Before the value of water transfers as a management tool can be fully realized, these problems need to be addressed.

The Water Transfer Program proposes a framework of actions, policies, and processes that, collectively, will facilitate water transfers and further development of a statewide water transfer market by addressing these problems. Because water transfers can impact third parties (those not directly involved in the transaction) and/or local groundwater, environmental, or other resource conditions, the framework also includes mechanisms to provide protection from such impacts.

Both the BDAC Water Transfer Work Group and the Transfer Agency Group were instrumental in identifying the issues which constrain the water transfer market. These were sorted into three broad categories to aid in developing resolution:

1. *Environmental, socio-economic, and water resource protections* - including:
  - Third party socio-economic impacts
  - Groundwater resource protection
  - Transfers to augment instream flow

- Environmental protection in source areas
  - Area of origin/watershed priorities
  - Rules/guidelines for environmental water transfers
2. *Technical, operational, and administrative rules* - including:
- Transferrable water and the "no injury rule"
  - Saved or conserved water
  - Operating criteria and/or carriage water requirements
  - Reservoir refill criteria
  - Streamlining the transfer approval process
3. *Wheeling and access to state/federal facilities (especially for cross-Delta transfers)* - including:
- Reliability of access for transferred water in existing project facilities
  - Priority of transferred water in new facilities
  - Wheeling costs

The Water Transfer Program recommends the following actions, policies, and processes as a framework for solutions to these constraints. Being programmatic in nature, it describes these only in enough detail to convey the direction and general purpose of each. More detail will be added to the framework between this public draft and a finalized Programmatic EIR/EIS. Some detail will necessarily occur during the months and years after the Programmatic EIR/EIS is finalized. During the next several months, the BDAC Water Transfer Work Group and the Transfer Agency Group will continue to work together to develop these solutions.

- **Establish the California Water Transfers Information Clearinghouse** to ensure that decisions regarding proposed water transfers can be made with all parties in possession of complete and accurate information and to provide information to facilitate assessment of potential third party impacts. The Clearinghouse would not function as a market broker, nor would the Clearinghouse operate as a water bank. The Clearinghouse would:
  - collect and disseminate data and information relating to water transfers and potential transfer impacts
  - perform research using historic data to understand water transfer impacts
  - provide a forum for discussion and comment on proposed transfers
- **Coordination among CALFED agencies to formulate policy**, under their existing authorities, for required water transfer analysis. This would require all transfer proposals which are subject to approval by the SWRCB or that depend on access to state/federal conveyance facilities to include information regarding potential socio-economic, groundwater, and cumulative impacts at the time of



submission for approval by the respective CALFED agency. Information would be provided by the transfer proponents. This is for public information purposes and would be disclosed through the California Water Transfers Information Clearinghouse.

- **Forecast and disclosure by DWR and USBR of potential conveyance capacity** to provide transfer proponents more timely information regarding the potential availability of conveyance capacity for cross-Delta water transfers and probabilities of it being available. Forecasts would occur on a monthly basis (in conjunction with water supply forecasts). Forecasts would be based on the best information available to project operators, but could not guarantee that the capacity would be available because of the numerous operating variables, including but not limited to: hydrologic conditions, ESA requirements, Delta water quality standards, and physical capacity limitations.
- **Development by CALFED agencies of a standardized checklist and analysis procedure** to be followed for each proposed water transfer that undergoes review by the SWRCB, DWR or USBR. This would guide transfer proponents through a series of questions, requesting specific information regarding the proposed transfer. This checklist would allow the proponents to prepare all the necessary information prior to submitting it to the SWRCB or other approving agency, greatly reducing the time spent trying to fill information gaps that often remain under the existing transfer approval process.
- **A process for CALFED agencies to work with stakeholder representatives to reduce the conflict between transfer proponents and the SWRCB, DWR, or USBR** regarding what water is deemed transferrable under what conditions. The objective of this process will be to define a standardized set of rules on transferable water. Clarification of the CALFED agencies' criteria for quantifying transferrable water, including potential variations in the accepted criteria for time or location (i.e., one-year transfers versus multi-year and in-basin versus out-of-basin) is a key outcome. The initial focus of this process would be technically based, resulting in a set of differing water transfer scenarios and accompanying definitions. Results of this effort may include formal rules adopted by the SWRCB during the initial years of CALFED's Stage 1 implementation. The details of this process, including the specific objectives, and the identification of stakeholder representatives, have not been determined.
- **A process for CALFED agencies to work with stakeholder representatives to resolve conflicts over reservoir refill and carriage water criteria.** This effort will focus on ensuring that neither water transfers involving releases from stored water nor the transport of water across the Delta cause adverse impacts to other

legal users of water. CALFED agencies may adopt a policy that requires proposed water transfers from storage to include a reservoir refill analysis identifying potential impacts to other legal users of water, and to identify appropriate mitigation measures. Carriage water is defined as the additional water that may be necessary to accompany a cross-Delta water transfer to maintain water quality or other standards imposed on Delta export operations. Clarifying carriage water criteria may be resolved with a longer term process that relates closely to other operational changes being proposed for Delta water management since they can impact the necessity for carriage water.

- **A process for CALFED agencies to work with stakeholder representatives to develop methodology to monitor instream transfers** and associated tracking measures. This process is designed to ensure that water transferred to the environment is available to meet its stated instream purpose throughout its designated reach. The process will also address opportunities for those buying water for instream purposes to make it available for re-diversion (resale) at given points downstream, if so desired. More specific actions and policies will likely be developed through this process prior to release of the final Programmatic EIR/EIS.
- **A process for CALFED agencies to work with stakeholder representatives to discuss costs associated with transporting transferred water through state or federal conveyance facilities.** This process will result in an agreed upon set of criteria governing the determination of transport costs such that transfer proponents can factor such costs into transfer proposals early in development phase of a potential water transfer deal. More specific actions and policies will likely be developed through this process prior to release of the final Programmatic EIR/EIS.

Once a final CALFED Bay-Delta Program Programmatic EIR/EIS is certified, implementation of these recommendations will begin. However, the processes described above (4 of the 8 bulleted items above) will be developed and in some cases instituted during 1999, before the Programmatic EIR/EIS is finalized. Where resolution on issues can be reached through these processes, resulting recommended solution options will be integrated into the final programmatic description and become part of the implementation plan. For the issues which cannot be satisfactorily resolved, the processes themselves would become part of the implementation plan contained in a certified Final Programmatic EIR/EIS.

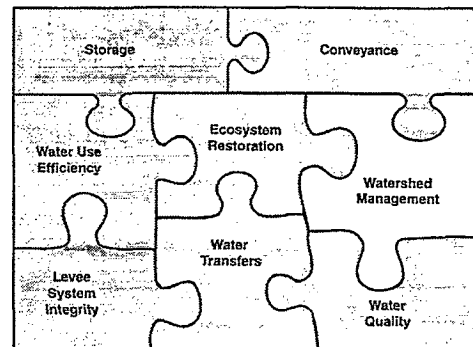
More information on the water transfer program will be included in the revised *Water Transfer Program Plan*.

## Watershed Program

The two main components of the Watershed Program are to provide assistance - both financial and technical - to local watershed programs, and to aide in the coordination and integration of local watershed programs. The Watershed Program supports and encourages locally-led watershed activities that benefit the Bay-Delta system.

Realizing that watershed approaches may vary, a set of guiding principles has been established. These guiding principles illustrate a "bottom-up" approach rather than "top-down." Emphasis is placed on the importance of

community involvement and support. In addition, the Watershed Program strives to strengthen the partnerships and relationships between the public, local watershed organizations, and governments at all levels. Like the CALFED Bay-Delta Program itself, watershed activities included in the Watershed Program should ensure that adaptive management processes can be applied at multiple scales and across ownerships.



In summary, the draft Watershed Program includes the following elements:

- **Support Local Watershed Activities** - Implement watershed restoration, maintenance, and conservation activities that support the goals and objectives of CALFED.

### WATERSHED PROGRAM GOAL

*To help coordinate and integrate existing and future local watershed programs and to provide technical assistance and funding for watershed activities and protection relevant to achieving the goals and objectives of the CALFED Bay-Delta Program.*

- **Coordination and Assistance** - Facilitate and improve coordination and assistance between government agencies, other organizations, and local watershed groups.
- **Watershed Monitoring Assessment** - Facilitate monitoring efforts that are consistent with CMARP's protocols and support watershed activities that ensure adaptive management processes can be applied.
- **Education and Outreach** - Support resource conservation education at the local watershed level and provide baseline support to watershed programs.

- **Watershed Processes and Relationships** - Identify the watershed functions and processes that are relevant to the CALFED goals and objectives, and provide examples of watershed activities that could improve these functions and processes.
- **Integration with Other Common Programs** - Improve the integration of the Common Programs, especially the efforts of the Watershed Program with the actions implemented under the Ecosystem Restoration and Water Quality programs.

Within the various Program elements, CALFED had originally proposed hundreds of programmatic actions in the "lower" watershed; however, relatively few actions were proposed in the "upper" watershed. These circumstances were a significant factor in the decision to elevate the watershed element to a Common Program status. The Watershed Program was developed to compensate for this imbalance by including actions in both the upper and lower watershed. Furthermore, the Watershed Program has not established watershed boundaries, but will include those watershed activities that demonstrate benefits to the Bay-Delta system.

The following are examples of watershed activities that can make improvements in each of the four CALFED problem areas:

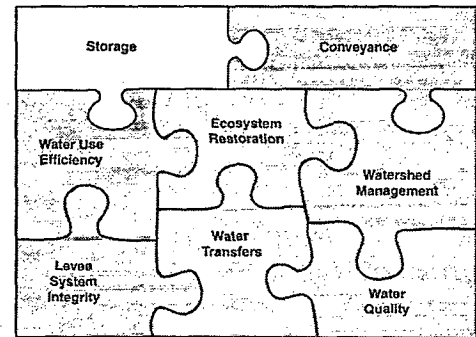
- **Ecosystem Quality** - Watershed activities that improve riparian habitat along streams, increase or improve fisheries habitat and passage, restore wetlands, or restore the natural stream morphology affecting downstream flows or species may benefit ecosystem quality.
- **Water Quality** - Watershed activities may benefit water quality in the Bay-Delta system by helping to identify and control non-point sources of pollution, and identify and implement methods to control or treat contaminants. Watershed activities which reduce the pollutant loads in streams, lakes, or reservoirs could measurably improve downstream water quality.
- **Water Supply Reliability** - Meadows and riparian corridors in the upper watershed tend to slow the rate of runoff and allow more percolation of water into aquifers. When meadows erode and riparian corridors are degraded, runoff during storms can occur at higher rates. This process makes flood management more difficult and reduces the opportunities to capture runoff in downstream reservoirs. Watershed activities designed to restore meadows and riparian corridors can attenuate the peak flows that occur during storms and allow more of this water to be absorbed into aquifers of the upper watershed. This water can contribute to increased stream base flow later in the season which improves water supply reliability and provides environmental benefits for fish and wildlife.

- **Levee and Channel Integrity** - Attenuation of flood flows coming from the upper watershed can provide benefits far downstream in the system. Delta levees are most vulnerable during high winter flows; watershed activities which reduce these flows can help maintain the integrity of the levees.

More information on the watershed program will be included in the revised *Watershed Program Plan*.

## Storage

Storage of water in surface reservoirs or groundwater basins can provide opportunities to improve the timing and availability of water for all uses. The benefits and impacts of surface and groundwater storage vary depending on the location, size, operational policies, and linkage to other Program elements. By storing during times of high flow and low environmental impact, more water is available for release for environmental and consumptive purposes during dry periods when conflicts over water supplies are critical. Properly managed, storage turns low value water into high value water for all uses.



Both groundwater and surface storage provide additional flexibility for managing water supplies, but there are differences in the potential operation of these two approaches to storage. Groundwater storage is generally viewed as having more benign on-site impacts to both environmental and other existing uses of the land. Depending on its operation, groundwater storage can also have significant water quality benefits. Finally, groundwater storage is generally less expensive than new surface storage facilities. On the other hand, surface storage can have flood control, power generation and regulation, and recreational benefits not generally available with groundwater storage. More importantly, surface storage is more suited to rapidly discharging or receiving large volumes of water, a distinct advantage in real-time management of high river flow periods or environmental storage releases.

Considering the magnitude of conflicts over available water in California, CALFED believes that it must aggressively evaluate and implement all available water management options to ensure water supply reliability. Therefore, aggressive implementation of water conservation, recycling, and a protective water transfer market are critically important for effective water management. New surface and groundwater storage will be constructed as necessary, considering appropriate implementation of nonstructural programs and demonstrated willingness to pay by potential beneficiaries, to meet CALFED's program goals. During Stage 1, CALFED will evaluate and

determine the appropriate mix of these water management tools.

Based on a programmatic evaluation of potential water supply benefits and practical consideration of acceptable levels of impacts and total costs, the range of total new storage considered for evaluation in Phase II was from zero up to about 6 MAF. This amount of new storage was considered a reasonable range for study purposes and impact analysis; much more detailed study and significant interaction with stakeholders will be required before specific locations and sizes of new storage are proposed. However, most water supply benefits of Sacramento River off-stream storage are achieved with about 3 MAF of storage, while most water supply benefits of south of Delta off-aqueduct storage are attained with about 2 MAF of storage.

Other types of surface storage considered in Phase II include San Joaquin River tributary storage and in-Delta storage. Relatively smaller volumes of storage are practical for these types of storage facilities due to engineering considerations. Groundwater banking and conjunctive use in the Sacramento and San Joaquin Valleys were also considered in Phase II. The practical storage capacity available for groundwater storage in these areas will be determined only after detailed study of specific projects and full consideration of local concerns. For study purposes, groundwater storage volumes of 250 TAF in the Sacramento Valley and 500 TAF in the San Joaquin Valley were considered. Although significant additional work needs to be completed to identify groundwater storage opportunities, possible sites include Stockton East, an expanded Kern Water Bank, and the Madera Ranch project. In addition, there may be significant opportunities for enhanced surface and groundwater storage within service areas dependent on Delta water for some or all of their supplies.

CALFED will focus on off-stream reservoir sites for new surface storage, but will consider expansion of existing on-stream reservoirs. CALFED will not pursue storage at new on-stream reservoir sites. Under the ecosystem restoration program element, some dams and stream obstructions will be removed to open additional areas of fishery habitat. Even with new dams for surface storage, there will be fewer stream miles blocked in California with implementation of the CALFED Bay-Delta Program.

For the purposes of the programmatic Phase II evaluation, an inventory of potential new surface storage projects was compiled. Those projects that appeared most feasible were evaluated to provide representative information on costs and benefits. A more complete screening process for surface storage opportunities, taking into account engineering feasibility, potential environmental impacts, costs, and benefits, will proceed over the coming months and will be documented in a future report. While screening remains to be completed, among possible locations for additional surface storage are Sites Reservoir, a modestly enlarged Shasta Reservoir, and enlarged Los Vaqueros Reservoir.

Of course, the relationship of water supply benefits to groundwater and surface storage volume is

highly dependent on operating assumptions. Much more detailed information about specific locations of new storage, potential allocation of storage benefits, and operational goals and constraints would be necessary to determine an optimal volume of storage from a water supply perspective.

A fundamental principle of the CALFED Program is that the costs of a program should be borne by those who benefit from the program. That principle is especially relevant in the decision about new storage facilities. In principle, public money will be used to finance storage projects only to the extent that the storage creates public benefits; user money should be used to finance the portion of storage that generates user benefits. This "user pays" principle is critical to the overall CALFED goal of increasing the efficiency of water use in California. CALFED is performing economic analyses evaluating new facilities and other approaches (such as conservation, recycling, and transfers) to identify cost-effective pathways to meeting CALFED objectives. These economic analyses will be especially useful in assisting all potential users of new storage to evaluate the relative costs and benefits of particular storage options.

The following linkages and conditions will guide development of groundwater/conjunctive use and new surface water storage. Agency and stakeholder input is needed to make the linkages and conditions for new storage more specific, and to develop appropriate "bundles" of actions so that all CALFED goals progress together.

**Groundwater/conjunctive use programs.** Groundwater/conjunctive use programs will be constructed as necessary to meet CALFED's goals provided:

- a. Groundwater monitoring, and modeling programs are established
- b. Complete all environmental documentation and permitting requirements
- c. Demonstrated commitment to finance by beneficiaries
- d. Full recognition is given to the rights of landowners
- e. Guidelines are in place to protect resources, address local concerns, and avoid potential impacts prior to implementing a conjunctive management operation. The draft guidelines developed to date include the following:
  - Funding support will be provided for local assessment of groundwater resources.
  - Conjunctive management programs will be voluntary.
  - The needs of landowners and users of local groundwater are protected.
  - Conjunctive management projects will be overseen by local agencies in partnership with other entities to assure that concerns are addressed through interest-based negotiation.
  - Groundwater withdrawals must be managed to avoid land subsidence and aquifer degradation.
  - Consistency with local groundwater plans (such as AB3030 Plans) and City and/or County Comprehensive General Plans

**Surface Storage.** New or expanded surface storage will be constructed as necessary to meet CALFED's goals in conjunction with the following actions (all actions will be bundled so they move forward together):

- a. A high level of water use efficiency is achieved throughout the solution area.
- b. Demonstrated progress on the water transfer framework
- c. Demonstrated commitment to finance by beneficiaries
- d. Complete all environmental documentation and permitting requirements including completion of site specific Clean Water Act Section 404 compliance

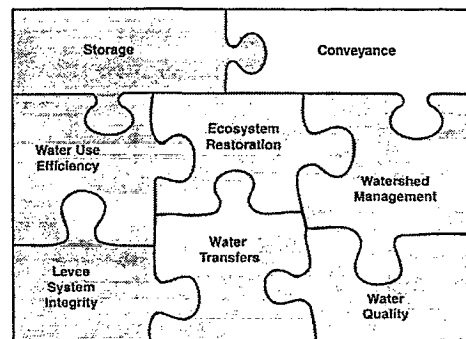
CALFED seeks to plan for recreation enhancement and, if necessary, to mitigate impacts to Delta recreation resulting from CALFED activities designed to restore other Delta resources. Construction of new facilities will provide for appropriate on-site recreation development. The responsibilities and procedures for recreation development at new storage and other facilities is clearly addressed in current law. Federal and state laws and local laws and plans govern recreation developments associated with water development projects in and near the Delta. The Draft Programmatic EIS/EIR and accompanying technical reports address general impacts that CALFED Program implementation could have on recreational resources and on how the recreational resources could impact the other parts of the Program. The time line of such a process should be consistent with the Phase III documentation and implementation schedule, ensuring that recreation resources are appropriately considered as part of the Bay-Delta solution.

The CALFED Program has no specific objectives for hydropower generation. However, CALFED does seek to minimize negative impacts on resources, such as hydropower generation, during and after implementation. The Program may result in temporary or long-term changes in river and reservoir operations, which may affect the quantity, timing and value of hydropower produced within the Bay-Delta system. Also, additional pumping may increase the amount of Project Energy Use (power consumed by the CVP and the SWP to move water through the system). An increase in Project Energy Use can reduce the amount of surplus hydropower that might otherwise be available for sale from the CVP (necessary to repay Project debt), and may increase the amount of power that must be purchased from outside sources to meet SWP Project Energy Use. Replacement for reduced availability of renewable hydropower would likely come from fossil fuel or other thermal generation. CALFED is coordinating with the Western Area Power Administration to assure that issues are identified and properly framed, so consequences and options are clear to stakeholders, the public, and the CALFED decision-makers.



## Conveyance

The Delta conveyance element of the Program describes the various configurations of Delta channels for moving water through the Delta and to the major export facilities in the southern Delta. While there are countless combinations of potential modifications to Delta channels, three primary categories of Delta configuration options, as described below, were studied in Phase II of the Program. These Delta conveyance options were the primary distinguishing features among the three broad categories of alternatives studied in Phase II.



Because of the potential impact on flow patterns and Delta water quality, the Delta conveyance configuration of an alternative can greatly affect the performance of other Bay-Delta program elements. The three primary Delta conveyance configurations evaluated in Phase II of the program are:

**Existing System Conveyance.** The Delta channels would be maintained essentially in their current configuration. One significant variation would include some selected channel improvements in the southern Delta together with flow and stage barriers at selected locations to allow for increasing the permitted pumping rate at the SWP export facility to full existing physical capacity of 10,300 cfs. These physical changes in the existing system include many of the features contained in the proposed Interim South Delta Project. Other variations that address the same needs are also being evaluated.

**Modified Through Delta Conveyance.** Significant improvements to northern Delta channels would accompany the southern Delta improvements contemplated under the existing system conveyance alternative. Variations include a wide variety of channel configurations, designed to improve flow patterns to benefit fisheries throughout the Delta, provide flood control, and improve water quality in many parts of the Delta.

**Dual Delta Conveyance.** The dual Delta conveyance alternative is formed around a combination of modified Delta channels and a new canal or pipeline connecting the Sacramento River in the northern Delta to the SWP and CVP export facilities in the southern Delta. Capacities for this new isolated conveyance facility in the range of 5,000 cfs to 15,000 cfs were evaluated in Phase II of the Program. The new facility would siphon under all major waterways to minimize aquatic impacts.

Not all of the Delta waterways follow natural channels. Some were constructed for navigation which is an important Delta function. In addition to periodic navigational work on many Delta waterways, the U.S. Army Corps of Engineers built and maintains two commercial shipping

channels through the Delta. The ports of Stockton and Sacramento are served by the Stockton Deep Water Ship Channel, completed in 1933, and the Sacramento Deep Water Ship Channel, completed in 1963. Most of the length of these channels have since been deepened to 35 feet. It is possible that changes in flow patterns may result in changed operation and maintenance requirements of the channels.

The existing Delta channels will be an integral part of any CALFED decision for Delta conveyance. The reliance on these channels provides a shared interest in restoring, maintaining, and protecting Delta resources, including water supplies, water quality, levees, natural habitat, and the common Delta Pool, which also protects in-Delta agricultural uses. Some modifications to these through Delta channels can improve all of these Delta resources. Regardless of choices that may be made in the future, it makes sense to invest in these modifications to maximize chances that CALFED can meet the Program's purpose.

**CALFED's basic strategy is to develop a through Delta conveyance alternative based on the existing Delta configuration with some modifications.** This strategy focuses on making the through Delta conveyance achieve CALFED purposes. Details of conveyance improvements will undergo subsequent environmental analysis, but are expected to be similar to the following:

- South Delta channels would remain in their existing configuration except that Old River would be enlarged in the reach north of Clifton Court to reduce channel velocities and associated scouring.
- A new 2,500 cfs at 0.2 fps through-screen velocity (5,000 cfs at 0.4 fps through-screen velocity) fish screen would be constructed for the Tracy Pumping Plant.
- A new 6,000 cfs at 0.2 fps through-screen velocity (12,000 cfs at 0.4 fps through-screen velocity) screened intake with low lift pumps would be constructed at the head of Clifton Court and the SWP and CVP would be connected to aid flexible operations.
- An operable fish control barrier would be constructed at the head of Old River. Operable flow control barriers or their equivalent would be constructed in south Delta channels to alleviate the problem with reduced water levels and water quality problems that would be caused by the fish control barrier and export operations.
- A new Hood diversion test facility (with fish ladder or equivalent for upstream migrating fish) on the Sacramento River capable of diverting up to 2,000 cfs from the Sacramento River to the Mokelumne River would be constructed.
- North Delta channels along the Mokelumne River from Interstate 5 to the San

Joaquin River would be enlarged by setback levees and dredging.

- San Joaquin River and Delta water quality improvement actions described in the Stage 1 action list and in more detail in the Water Quality Program Plan would be implemented.
- Source control measures for drinking water quality, including aqueduct watershed management measures, as described in the Stage 1 action list and in more detail in the Water Quality Program Plan would be implemented.
- Ecosystem Restoration measures for fishery improvement as described in the Stage 1 action list and in more detail in the Ecosystem Restoration Program Plan (including DEFT actions) would be implemented.

Modifications to the through Delta conveyance strategy will be only made after thorough assessment of a variety of factors. For example, a decision to construct an isolated facility will be warranted if, after aggressive implementation of relevant common program elements and improvements to through Delta conveyance, there is still a public health necessity for improved drinking water at the source (e.g., bromide levels) arising from technical or economic infeasibility of providing safe drinking water through other methods, and/or there is inability to achieve fishery recovery with continuing impacts of diversions from the south Delta. A combination of these two factors could also result in a decision for an isolated facility and/or other additional actions to meet CALFED goals. These factors will be continually reevaluated during Stage 1 as part of the adaptive management process, and will form the basis for a comprehensive set of additional improvements in Stage 2. Such reevaluation could be assisted by panels of recognized technical experts that would consider all of the relevant information and, in conjunction with stakeholder input, make recommendations to the appropriate decision making body.

To provide for the best adaptive management decision making in the future, aggressive monitoring and research, as well as thorough development and evaluation of alternatives must occur. For drinking water quality issues this means Stage 1 must include the following:

1. Performance of public health effects studies to more specifically identify the potential health effects of bromide related disinfection byproducts.
2. Investigation of alternative sources of high quality water supply for municipal users of Delta water.
3. Investigation of advanced treatment technologies for the removal of salt, bromide, total organic carbon, and pathogens in municipal water supplies.

4. Investigation of combinations of new supplies and technologies that can minimize salt content of municipal water supplies and provide greater public health protection.

For fishery issues, Stage 1 must include adequate monitoring and research to answer the following questions:

- What measures have been taken to restore fisheries?
- How adequate are the measures?
- How are the actions affecting target species, and are there any unexpected adverse effects on other species?

If a decision to build an isolated facility were ultimately made, it would be coupled with each of the following assurances:

1. An agreement limiting the amount of water that can be exported (linked to water year types and flexible enough to allow additional exports when conditions allow).
2. Commitment to preserve in-Delta water quality sufficient to protect existing beneficial uses (Delta standards or contracts including assurances for implementation, permits, financing, and O&M).
3. Commitment to address potential seepage and flood impacts of an isolated facility along its alignment.
4. Long-term funding for Delta levees (perhaps tied to quantity of water moved in the isolated facility or other institutional assurances) and commitment to provide at cost, suitable excess excavated material from facility construction for levee and habitat improvements.
5. Reaffirm commitment to protect all area of origin water rights.
6. Completion of all environmental documentation and permitting requirements.
7. Demonstrated commitment to finance by beneficiaries.
8. Agreement on operating authority and operating criteria.

**E-004258**

## Shallow Channel Isolated from Snodgrass Slough

## Setback Levees and Channel Modifications

## Channel Enlargement

## ***Intertie***

## Up to 2.0 MAF Off-Aqueduct Storage

**Up to 500 TAF  
Surface Storage**

**Up to 500 TAF  
Groundwater Storage**

(Adaptive Management  
for all)

## Operable Flow Control Barrier

## Operable Fish Control Barrier

## 4.2 Supporting Information

Each program element employs an adaptive management approach where we constantly monitor performance and modify (adapt) future actions as we learn more about the system and how it responds to our efforts. The implementation of the preferred program alternative is also facilitated by three supporting plans/programs:

- **Assurances and Governance Plan** - A set of tools and mechanisms to assure that the Program will be implemented and operated as agreed including provision for contingency response to address potential future changing conditions.
- **Financing Plan** - Identifies financing principles, cost allocation and cost sharing considerations, and Program element cost estimates needed to adequately fund the Program over 30 years.
- **Comprehensive Monitoring, Assessment and Research Program (CMARP)** - Monitoring key system functions (or indicators), completing focused research to obtain better understanding, assessing the results, and staging implementation based on information gained are all central to the adaptive management process

These are described in more detail in the Chapter 5 Implementation Plan.



## 5. DRAFT IMPLEMENTATION PLAN

Phase II of the CALFED Bay-Delta Program will culminate with the Federal Record of Decision and the state Certification of the Final Programmatic EIS/EIR (expected to be completed late 1999). At that time, Phase III of the CALFED Bay-Delta Program will begin implementation of the preferred program alternative. Phase III is expected to extend 30 years or more.

Program implementation during Phase III will be guided by the implementation plan. The plan focuses on the early years of implementation when needed actions are better known but also provides a long-term vision for continuing implementation over the next several decades.

The implementation plan cannot be completed until the final programmatic EIS/EIR is completed and the complete "decision" is defined. Therefore, this draft implementation plan, like other chapters of the *Revised Phase II Report*, is a work in progress. The draft implementation plan contains the following parts:

- **Actions and Assurances for 1998-99** - CALFED agencies will use their existing authorities to pursue ongoing actions which are consistent with the CALFED framework
- **Stage 1 Actions** - A list of proposed actions for the first seven years of implementation following the Record of Decision and Certification of the EIS/EIR
- **Water Operations** - Draft concept for water operations criteria for the first seven years of implementation
- **Assurances and Governance Plan** - Set of tools and mechanisms to assure that the Program will be implemented and operated as agreed
- **Financing Plan** - Plan for funding the implementation of the preferred alternative including financing principles, cost allocation and cost sharing considerations, and Program element cost estimates
- **Comprehensive Monitoring, Assessment and Research Program** - Plan for monitoring and research that provides the data and necessary information to evaluate the performance of completed actions for use in supporting the adaptive management of future actions
- **Adaptive Management** - Plan to constantly monitor the Bay-Delta system and adjust future implementation as we learn more about the system and how it responds to our efforts
- **Long-Term Implementation** - A general vision (subject to adaptive management and the conditional decisions) for the 30-year Program implementation
- **Draft Stage 1 Environmental Compliance Strategy** - Framework for efficient processing of information needed for conforming with the regulatory procedures of the different agencies and their protocols, guidelines and time lines



## 5.1 Actions and Assurances for 1998-99

During the period before the final EIS/EIR and ROD are issued in the fall of 1999, the CALFED agencies will continue to make progress in implementing, coordinating, and expanding ongoing project specific actions to provide additional benefits for environmental, urban, and agricultural users, where consistent with the CALFED Bay-Delta Programmatic framework. Project specific actions to pursue include:

- Complete programmatic implementation plan
- Develop and implement the annual CVP/SWP Operations Plan
- Expand south of Delta groundwater storage
- Facilitate additional short-term water transfers
- Improve coordination of Category III, Bay-Delta Act, CVPIA and other expenditures for ecosystem restoration projects
- Initiate environmental documentation and feasibility analysis for projects that could be implemented early in Stage 1
- Target and increase funding for water conservation, reclamation, water quality, and floodplain and watershed management programs
- Seek continued funding for Delta levees program.
- Issue final State Water Resources Control Board water rights decision to allocate responsibility for meeting the 1995 Water Quality Control Plan
- Extend the Bay-Delta Accord to provide operational and environmental stability through December 1999, at which time CALFED anticipates the ROD will be issued
- Resolve permitting issues and, as appropriate, initiate south Delta improvement actions
- Incorporate ongoing and planned monitoring and studies into the CALFED Comprehensive Monitoring Assessment and Research Program (CMARP)

Attachment D contains a short summary of each action.

## 5.2 Stage 1 Actions

Stage 1 is defined as the seven year period commencing with the final decisions on the Programmatic EIS/EIR. Agreement on Stage 1 actions is only one part of the decision for a preferred program alternative but, it is important that these actions achieve balanced benefits and lay a solid foundation for successful implementation of the Program.

The following pages provide more detail on potential actions for Stage 1. **These actions will be more fully developed as parts of the preferred program alternative for the *Revised Draft***

***Programmatic EIS/EIR and for the Final Programmatic EIS/EIR.***

Adaptive management is an essential part of the implementation strategy for every program element to allow necessary adjustments as conditions change in future stages of implementation and as more is learned about the system and how it responds to restoration efforts. Consistent with the concept of adaptive management, some actions may need to be refined within the time frame of Stage 1 to reflect changing conditions or new information.

The outcome of and certain sites for Stage 1 decisions will not be known until additional information, including need for mitigation, is available and until the options to carry out these Stage 1 proposals have undergone environmental review. Consequently, the outcome could be altered as a result of that second tier environmental review and mitigation measures imposed as a part of those actions. However, if the impacts from the actions in Stage 1 have been included in the Programmatic EIS/EIR, the subsequent environmental documents can tier off the Programmatic document for cumulative and long-range impacts of the Programmatic decision.

Each potential action in the following Stage 1 list includes an estimate (in parenthesis) of when the action may occur within Stage 1. For example, "(yr 1)" indicates the action is expected to occur in the first year following the final decisions on the Programmatic EIS/EIR.

CALFED will continue work between the Revised Draft EIS/EIR and the Final EIS/EIR on grouping the Stage 1 actions into a series of bundles (packages) which can provide additional assurances for balancing benefits. For example, a package of actions in the Delta could include levee work, habitat improvements, water quality work, and facilities and operations to improve water supply reliability. Packages for some actions may be geographical, based on timing, or other grouping. Linking the actions would help assure that they all move forward together. These may be linked within the same project EIS/EIRs, tied by contractual documents, dependent on the same funding, or other means.

**Levees**

*The focus of the long-term levee protection element of the Program is to reduce the risk to land use and associated economic activities, water supply, infrastructure, and the ecosystem from catastrophic breaching of Delta levees. Levee protection is an ongoing effort which builds on the successes on ongoing programs and consists of:*

- *Base-level funding to participating local agencies*
- *Funding of special improvement projects for habitat and levee stabilization to augment the base-level funding*
- *Grant projects to develop best management practices for subsidence control*
- *An advanced measures plan and emergency management plan to more effectively*

*plan for and deal with potential levee disasters*

- *A seismic risk assessment to evaluate performance of the existing levee system during seismic events*

*The first stage continues the decades-long process to improve reliability of Delta levees.*

1. Develop and implement an outreach, coordination, and partnering program with local landowners including individuals, cities, counties, reclamation districts, resource conservation districts, water authorities, irrigation districts, farm bureaus, other interest groups, and the general public to assure participation in planning design, implementation, and management of levee projects (yr 1).
2. Obtain short-term federal and state funding authority as a bridge between the existing Delta Flood Protection Authority (AB360) and long-term levee funding (yr 1-5).
3. Obtain long-term federal and state funding authority (yr 1-7); e.g., the Corps of Engineers' current Delta Special Study would develop into a long-term Delta levee reconstruction program and the state would be the local cost-sharing partner.
4. Conduct project level environmental documentation and obtain appropriate permits for each bundle (package) of Stage 1 actions (yr 1-7).
5. Implement demonstration projects for levee designs that minimize the need for continuous disruption of habitat from levee maintenance and minimize the need for ongoing mitigation from disrupted habitat (yr 1-7).
6. Coordinate Delta levee improvements with ecosystem improvements (yr 1-7); e.g., coordinate improvements, modify maintenance manuals as appropriate to accommodate ERP actions near levees, separately track levee mitigation costs and ERP costs.
7. Fund levee improvements up to PL84-99, approximately \$114 million [\$74 million during years 1 through 5 and \$40 million during years 6 through 7] in first stage (yr 1-7); e.g., proportionally distribute available funds to entities making application for cost sharing of Delta levee improvements.
8. Further improve levees which have significant statewide benefits, approximately \$82 million [\$58 million during years 1 through 5 and \$24 million during years 6 through 7] in first stage (yr 1-7); e.g., statewide benefits to water quality, highways, etc.
9. Coordinate Delta levee improvements with Stage 1 water conveyance, water quality improvements and with potential conveyance improvements in subsequent stages (yr 1-7).
10. Institute the Emergency Management Plan (yr 1-7); e.g., establish \$10 million revolving fund, refine command and control protocol, stockpile flood fighting supplies, establish standardized contracts for flood fighting and recovery operations, outline environmental considerations during emergencies.
11. Initiate a subsidence control program to develop and implement BMP's for lands

- adjacent to levees, approximately \$11 million for Stage 1 (yr 1-7).
12. Continue evaluation of seismic risk to integrity of the levee system and effective ways to mitigate that risk (yr 1-7).

## Water Quality

*The water quality program will consist of a wide variety of actions to provide good water quality for environmental, agricultural, drinking water, industrial, and recreational beneficial uses of water. The majority of current water quality actions rely on comprehensive monitoring, assessment, and research to improve understanding of effective water quality management and on the ultimate control of water quality problems at their sources. The Stage 1 water quality effort focuses on reducing constituents contributing toxicity to the ecosystem and affecting water users (including BOD) and on reducing total organic carbon loading, salinity, and pathogens that degrade drinking water quality. In addition, research and pilot studies are recommended to obtain information prior to implementation of some actions.*

1. Prepare project level environmental documentation and permitting as needed (yr 1-7).
2. Coordinate with other CALFED program elements to ensure that in-Delta modifications maximize potential for Delta water quality improvements (yr 1-7).
3. Continue to clarify use of and fine-tune water quality performance targets and goals (yr 1-7).
4. Conduct the following evaluation and abatement mercury work:
  - Cache Creek*
    - Risk appraisal and advisory for human health impacts of mercury (yr 1-5).
    - Determine bioaccumulation effects in creek and delta (yr 1-4).
    - Source, transport, inventory, mapping and speciation of mercury (yr 1-7).
    - Information Management/Public Outreach (yr 5-7).
    - Participate in stage 1 remediation (drainage control) of mercury mines if federal Good Samaritan protection obtained (yr 3-5).
    - Investigate sources of high levels of bioavailable mercury (yr 4-7).
  - Sacramento River*
    - Investigate sources of high levels of bioavailable mercury, inventory, map, and refine other models (yr 3-7).
    - Participate in remedial activities (yr 7).
  - Delta*
    - Research methylization (part of bioaccumulation) process in Delta (yr 1-2).
    - Determine sediment mercury concentration in areas that would be dredged during levee maintenance or conveyance work (yr 3-7).
    - Determine potential of ecosystem restoration work on mercury levels in

- lower and higher trophic level organisms (yr 3-5).
5. Conduct the following pesticide work:
    - Develop diazinon and chlorpyrifos hazard assessment criteria with DFG (yr 1).
    - Develop BMPs for dormant spray and household uses (yr 1-3).
    - Study the ecological significance of pesticide discharges (using \$1.5 million of ERP funds) (yr-1-3).
    - Support implementation of BMPs (yr 2-7).
    - Monitor to determine effectiveness (yr 4-7).
  6. Conduct the following heavy metals work:
    - Determine spatial and temporal extent of metal pollution (yr 3-7).
    - Determine ecological significance and extent of copper contamination (yr 1-3).
    - Review impacts of other metals such as cadmium, zinc, and chromium (yr 1).
    - Participate in Brake Pad consortium to reduce introduction of copper (yr 1-7).
    - Partner with municipalities on evaluation and implementation of stormwater control facilities (yr 2-5).
    - Participate in remediation of mine sites as part of local watershed restoration and delta restoration (yr 2-7).
  7. Conduct the following salinity reduction work:
    - Develop and implement supply water quality management activities to improve supply quality (yr 1-7).
    - Develop and implement a management plan to reduce drainage and reduce total salt load to the valley (yr 1-7).
    - Conduct pilot projects to evaluate the feasibility of water reuse, through agroforestry, of various concentrations of saline water (yr 4-6).
    - Study feasibility of desalination methods including reverse osmosis (yr 7).
    - Study cogeneration desalination (yr 7).
    - Implement real time management of salt discharges (yr 3-7).
  8. Conduct the following selenium work:
    - Conduct selenium research to fill data gaps in order to refine regulatory goals of source control actions; determine bioavailability of selenium under several scenarios (yr 1-5).
    - Research interactions of mercury and selenium (yr 2-3).
    - Refine and implement real-time management of selenium discharges (yr 1-7).
    - Expand and implement source control and reuse programs (yr 1-7).
    - Coordinate with other programs (yr 1-7); e.g., recommendations of San Joaquin Valley Drainage Implementation Program, CVPIA) for retirement of lands with drainage problems that are not subject to correction in other

- ways. (CVPIA alone will retire approximately 70,000 acres of land with selenium-caused water quality problems during time period of Stage 1.)
9. Conduct the following sediment reduction work/organochlorine pesticides:
    - Participate in implementation of USDA sediment reduction program (yr 1-7).
    - Promote sediment reduction in construction arenas and urban SW, and other specific sites (yr 1-7).
    - Implement stream restoration and revegetation work (yr 4-7).
    - Quantify and determine ecological impacts of sediments in target watersheds, implement corrective actions (yr 4-7).
    - Coordinate with ERP on sediment needs (yr 1-3).
  10. Conduct the following nutrients work:
    - Complete studies of causes for DO sag in San Joaquin River (yr 1-2).
    - Define and implement corrective measures for DO sag (yr 1-7).
    - Encourage regulatory activity to reduce nutrients discharged by unpermitted dischargers (yr 1-7).
    - Develop inter-substrate DO testing in conjunction with ERP (yr 2-4).
    - Study nutrient effects on beneficial uses (yr 4-7).
  11. Conduct the following unknown toxicity work:
    - Participate in identifying unknown toxicity and addressing as appropriate (yr 1-7).
  12. Other actions specific to drinking water improvements:
    - Control TOC contribution through control of algae, aquatic weeds, agricultural runoff, and watershed improvement (yr 1-7).
    - Study Bromide and disinfection byproduct control and implement at affected sites (yr 1-7)
    - Control of pathogens through control of cattle, urban storm water, sewage, boat discharge, and possibly recreational swimming; includes various projects depending on area of impact (yr 3-7).
    - Study recreational swimming impacts, wild animal impacts (yr 4).
    - Relocate Barker slough intake (yr 7+).
    - MTBE reductions in various areas (yr 3-5).
    - Address water quality problems in terminal reservoirs (yr 3-5).
    - Develop a plan sufficient to meet forthcoming EPA and Department of Health Services standards for brominated disinfection byproducts (by yr 7).
  13. Conduct the following turbidity and sediment work:
    - Implement protection actions in the upper watershed to reduce sedimentation of fish spawning habitat (yr 1-7).
    - Implement erosion control BMPs in the upper watershed (yr 1-7).
    - Construct sedimentation basins in urban and suburban areas (yr 1-7).
    - Evaluate use of a head control structure on lower Dominici Creek (yr 2-4).

- Perform quantitative analysis of river sediment loads, budgets, and sources (yr 1-7).

## Ecosystem Restoration

*The CALFED ecosystem restoration program (ERP) is designed to maintain, improve, and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species. A foundation of this program element is the restoration of ecological processes associated with streamflow, stream channels, watersheds, and floodplains. Implementation of the ERP over the 20 to 30 year implementation period will be guided through an ecosystem-based, adaptive management approach. ERP goals and objectives for ecosystem, habitat, and species rehabilitation are designed to produce measurable and progressive improvements to the Bay-Delta ecosystem that should result in a high level of ecosystem health and species recovery that exceeds existing regulatory requirements while improving water supply reliability and water quality of the Bay-Delta Ecosystem. The Stage 1 restoration efforts are structured to accomplish significant improvement in Bay-Delta ecological health through a large scale adaptive management approach in which the actions inform management decisions in later stages of implementation.*

*Success of ERP Stage 1 actions is also critically dependent on other program elements, including water quality improvement actions throughout the Bay-Delta watershed, levee system integrity actions, and integration with a watershed management strategy and a water transfers market. The priorities for restoration activities will be first on existing public lands as appropriate, second to work with landowners in voluntary efforts to achieve habitat goals including the acquisition of easements, third a combination of fee and easement acquisition, and fourth on acquisition of fee title as necessary to achieve program objectives. Acquisition will be on a willing seller basis and with emphasis on local coordination and partnerships and include appropriate mitigation for agricultural resource impacts. The intent is to maximize habitat benefits while minimizing land use impacts.*

1. Develop and implement an outreach, coordination, and partnering program with local landowners and individuals, cities, counties, reclamation districts, the Delta Protection Commission, resource conservation districts, water authorities, irrigation districts, farm bureaus, other interest groups, and the general public to assure participation in planning design, implementation, and management of ERP projects.
2. Conduct project level environmental documentation and permitting as needed for each bundle of Stage 1 actions(yr 1-7).
3. Full coordination with other ongoing activities which address ecosystem restoration in the Bay-Delta system (yr 1-7); e.g., CVPIA, Four Pumps Agreement, etc.

4. Implement habitat restoration in the Delta, Suisun Bay and Marsh, and Yolo Bypass to improve ecological function, facilitate recovery of endangered species, and determine the feasibility and desirability of implementing larger scale habitat restoration in future stages (yr 1-7):
  - Restore major habitat corridors with a mosaic of habitat types along the Mokelumne and San Joaquin Rivers, within the Yolo Bypass, and along other major fish migration corridors as practicable (yr 1-7).
  - Implement tidal wetland restoration pilot projects to test the effectiveness of larger scale restoration at various locations in the Delta.
  - Restore large expanses of shallow water habitat in open water areas of the Delta.
5. Implement large-scale, restoration pilot projects on select rivers (possibly Clear Creek, Deer Creek, and the Tuolumne River) that would include implementation of all long-term restoration measures in coordination with the watershed management common program and monitoring of subsequent ecosystem responses to learn information necessary for making decisions about implementing similar restorations in Stage 2 (yr 1-7).
6. Develop an ecosystem water market (potentially \$20 million per year) and acquire 100,000 acre-feet of water for critical ecosystem and species recovery needs (yr 1-7).
7. Complete targeted research and scientific evaluations needed to resolve the high priority issues and uncertainties (e.g., instream flow, exotic organisms, and Bay-Delta food web dynamics) to provide direction for implementing the adaptive management process and information necessary for making critical decisions in Stage 2 (yr 1-7).
8. Establish partnerships with universities for focused research (yr 1-7).
9. Complete the remaining 60% of the easements and/or acquisition for the Sacramento River meander corridor identified under the SB 1086 Program [approximately \$30 million required]. Provide assurances for and participation by Sacramento River users and landowners that provides indemnification of affected parties against flooding impacts on neighboring landowners and impacts on water diverters (yr 1-7).
10. Acquire flood plain easements, consistent with ecosystem needs along the San Joaquin River in coordination with the Corps of Engineers' Sacramento and San Joaquin River Basins Comprehensive Study (yr 4-7).
11. Continue high priority actions that reduce stressors of direct mortality to fishes (yr 1-7):
  - Aggressively screen existing unscreened or poorly screened diversion on the Sacramento River, San Joaquin River, and tributary streams.
  - Remove select physical barriers to fish passage.
12. Continue gravel management (yr 5-7); e.g., isolate gravel pits on San Joaquin River tributaries and relocate gravel operations on Sacramento River tributaries



- (most gravel work would be implemented in subsequent stages with designs and plans for ecosystem reclamation of gravel mining sites).
13. Improve research, monitoring, detection, and control of exotic species (yr 1-7):
    - Implement invasive plant management program in Cache Creek.
    - Develop ballast water management program.
    - Develop early-response invasive organism control programs.
  14. Explore ways to provide incremental improvements in ecosystem values throughout the Bay-Delta system in addition to habitat corridors described above (yr 1-7); e.g., pursue actions that are opportunity-based (willing sellers, funding, permitting, etc.), provide incremental improvements on private land through incentives, develop partnerships with farmers on "environmentally friendly" agricultural practices, etc.
  15. Incorporate ecosystem improvements with levee associated subsidence reversal plans (yr 1-7).
  16. Evaluate the feasibility of harvest management to protect weaker stocks (yr 1-7).

## Water Use Efficiency

*The CALFED water use efficiency element focuses on formulation of policies which support implementation of efficiency measures at the local and regional level. The role of CALFED agencies in water use efficiency will be to offer support and incentives through expanded programs to provide planning, technical, and financial assistance. CALFED agencies will also support institutional arrangements that give local water suppliers an opportunity to demonstrate that cost-effective efficiency measures are being implemented. The first stage implements the processes which will continue in subsequent stages.*

1. Expand State and Federal programs (DWR, USBR, USFWS, DFG, DHS, and SWRCB) to provide technical and planning assistance to local agencies in support of local and regional conservation and recycling programs (yr 1-7).
2. Create public advisory committee to advise State and Federal agencies on structure and implementation of assistance programs, and to coordinate Federal, State, regional and local efforts for maximum effectiveness of program expenditures (yr 1).
3. Develop a certification process for Urban Water Management Plans: select agency to act as certifying entity, obtain legislative authority, carry out public process to prepare regulations, implement program beginning with plans submitted in 2005. Access to CALFED benefits will be contingent upon certification of a supplier's Urban Water Management Plan (yr 1-3).
4. Implement a process for certification of water suppliers' compliance with the terms of the urban MOU with respect to analysis and implementation of Best Management Practices for urban water conservation. Provide funding support for

- the entity selected to carry out this function. Access to CALFED benefits will be contingent upon certification of a supplier's compliance with the terms of the urban MOU (yr 1-7).
5. Implement a process (e.g., AB 3616 Agricultural Water Management Council and CVPIA) for endorsement of water suppliers' compliance with respect to analysis and implementation of Efficient Water Management Practices. Provide funding support for the entity selected to carry out this function. Access to CALFED benefits will be contingent upon endorsement of a supplier's compliance with the terms of the process (yr 1-7).
  6. Resolve legal, institutional, and funding limitations for agricultural and urban water recycling. Secure loan and/or grant funding for water conservation (\$200 million in Stage 1) and water recycling (\$500 million in Stage 1) capital improvement projects. (yr 1-3).
  7. Develop and implement a program to improve local water management for multiple benefits. This program would help meet CALFED objective for water supply reliability, water quality, and ecosystem quality by identifying appropriate local actions, apportioning benefits and associated cost shares, securing funding, and providing technical implementation assistance (yr 1-7).
  8. Implement the methodology for refuge water management which was recently developed, based upon stakeholder and scientific input, including preparation of an Effective Water Use Plan and annual reports by each refuge manager (yr 1-7). Consistent with assurance mechanisms for urban and agricultural water users, access to CALFED benefits will be contingent upon continued implementation of the Effective Water Use Plan (yr 1-7).
  9. Encourage and support research to expand potential water use efficiency measures (yr 1-7).

## Water Transfer Framework

*The water transfer framework is designed to facilitate and streamline the water transfer process while protecting water rights and legal users of water and addressing and avoiding or mitigating third-party socio-economic impacts and local groundwater or environmental impacts. This would occur through a proposed framework of actions, policies and processes. The first stage implements the processes which will continue in subsequent stages.*

1. Establish the California Water Transfers Information Clearinghouse to collect and disseminate data and information relating to water transfers and potential transfer impacts, perform research using historic data to understand water transfer impacts, and provide a forum for discussion and comment on proposed transfers (yr 1).
2. Coordinate with CALFED agencies to formulate policy, under their existing authorities, for required water transfer analysis (yr 1).

3. Begin forecast and disclosure process (DWR and USBR) of potential conveyance capacity in existing export facilities. This would be an on-going activity, occurring in conjunction with hydrologic forecasts (yr 1).
4. Develop a standardized checklist and analysis procedure (SWRCB, DWR, and USBR) to be followed by transfer proponents for proposed transfers (yr 1-2).
5. CALFED agencies work with stakeholder representatives to reduce the conflict between transfer proponents and the SWRCB, DWR, or USBR regarding what water is deemed transferrable under what conditions (yr 1-3).
6. CALFED agencies continue work with stakeholder representatives to resolve conflicts over reservoir refill and carriage water criteria (yr 1-3).
7. CALFED agencies adopt methods to monitor instream transfers and develop associated tracking measures (yr 2-4).
8. CALFED agencies adopt criteria governing the determination of transport costs in state and federal conveyance facilities (both existing and new, if constructed) (yr 2-4).

## Watershed Program

*The Watershed Program is designed to be coordinated and integrated with existing and future local watershed programs and to provide technical assistance and funding for watershed activities that support the goals and objectives of the CALFED Bay-Delta Program. The actions during Stage 1 are a mix of watershed coordination, restoration, maintenance, and conservation activities, as well as demonstration projects designed to show benefits to the Bay-Delta system without harm to existing watershed resources.*

1. Fund and implement watershed restoration, maintenance, conservation, and monitoring activities that support the goals and objectives of the CALFED Bay-Delta Program (years 1-7).
2. Identify priority locations and implement watershed restoration activities which benefit restoration in the Bay-Delta system (years 1-7).
3. Assist local watershed groups and government agencies to address common issues, including roles and responsibilities, funding support, technical assistance, information exchange, and to ensure effective communication and implementation among government agencies and stakeholder groups (years 1-7).
4. Develop a funding process and provide watershed stewardship funds to build the capacity of locally controlled watershed groups that ensure participation of local landowner groups (years 1-7).
5. Improve the use and usefulness of existing or future watershed clearinghouse functions to assist watershed groups with obtaining information on funding opportunities, technical assistance, and data storage and retrieval (years 1-7).
6. Ensure the completion of project level environmental documentation and

- permitting; assist with documentation and permitting processes as appropriate (years 1-7).
7. Evaluate the benefits (including economics) that accrue from watershed plans and projects designed to achieve CALFED goals and objectives (yr 1-7).
  8. Establish, fund, and maintain watershed restoration and maintenance assistance to aide local watershed groups and private landowners in project concept, design, and implementation (years 1-7).
  9. Coordinate with other CALFED and non-CALFED programs on watershed related activities (years 1-7).

## Storage

*New storage will be included in the preferred program alternative as necessary to meet CALFED's goals and provided conditions and linkages for implementation are satisfied.*

**Groundwater Banking and Conjunctive Use** - *This first stage includes a coordination effort with local implementing entities and landowners, and may include construction of several projects. Additional projects, if feasible, could be constructed in later stages.*

1. Develop and implement a framework for groundwater banking and conjunctive use projects (yr 1).
2. Include provision to protect overlying and other landowners' water rights (yr 1-7).
3. Provide funding assistance for groundwater plan development (yr 1-7).
4. Identify potential projects and local cooperating entities and define CALFED role (yr 1-7).
5. Conduct baseline monitoring and modeling (yr 1-7).
6. Initiate field studies (yr 2-7).
7. Project environmental documentation and permitting (yr 3-7).
8. Project design (yr 4-7).
9. Conduct demonstration projects and construct two to three production facilities with target volume of 500,000 acre-feet storage (yr 1-7); e.g., potential options include Madera Ranch, Stockton East, expanded Kern Water Bank, and others.

**Surface Storage** - *New offstream storage and/or expansion of existing onstream reservoirs could add up to several million acre-feet of new surface storage. A description of three to five possible sites will be available at the start of Stage 1. The first stage will consist of feasibility studies, evaluations, and permitting compliance procedures. Initiation of construction will proceed as necessary to meet CALFED program goals provided conditions and linkages have been satisfied.*

1. Identify initial local partners and other cooperating entities for projects and

- CALFED role (yr 1-3).
2. Develop environmental documentation (yr 1-5).
3. Perform feasibility studies (yr 1-5).
4. Perform field studies (yr 1-5).
5. Finalize 404(b)(1) analyses (yr 1-5).
6. Site selection (yr 4-5).
7. Evaluate improvements to potential conveyance to storage (yr 1-5).
8. If ready, obtain permits and negotiate operating agreements (yr 5-7).
9. Identify beneficiaries and negotiate cost sharing agreements (yr 5-7).
10. Begin construction if conditions and linkages are satisfied (yr 6-7).

## Conveyance

*CALFED's basic strategy is to develop a through Delta conveyance alternative based on existing Delta configuration with some modifications. Some construction of improvements in the south and north Delta should occur within the first stage to improve conditions for ecosystem and water management reliability. Part of the first stage consists of studies and evaluations of the major conveyance features. This will allow conveyance projects to be ready for permitting and construction in later stages should the projects be necessary to meet Program objectives.*

**South Delta Improvements** - *South Delta improvements consist of methods to control flow, stage and circulation, improve fish passage, fish screen and salvage facilities, and provide SWP/CVP interties upstream and downstream of the export pumps. South Delta conveyance improvements included in Stage 1 would function with the basic conveyance strategy or potential modifications.*

1. Complete environmental documentation and permitting including 404(b)(1) analysis (yr 1).
2. Design south Delta improvements (yr 1); among others, such improvements could include:
  - Operable fish barrier at head of Old River to improve San Joaquin salmon survival and improve water quality in lower San Joaquin River below the Barrier (*Note: May impair upstream migration of San Joaquin salmon in the fall and increase entrainment of organisms living in the central and southern Delta*)
  - Three south Delta waterway control structures to protect south Delta agricultural water supplies
  - Clifton Court Forebay intake structure
  - Channel enlargement along Old River
  - Modified operation rules, including increased use of full capacity of Banks Pumping Plant linked to improved fish protections (flexible operations)

3. Implement south Delta improvements [balanced to improve water supply and environmental conditions] (yr 2-4).
4. Determine whether to implement an intertie between the Delta-Mendota Canal (at approximately Mile 8) and the California Aqueduct downstream of export pumps (yr 2-4) and if determined to be needed implement the project (yr 5-7).
5. Construct new Tracy demonstration/testing fish screen and handling facility capable of screening 2,500 cfs at 0.2 fps through-screen velocity and 5,000 cfs at 0.4 fps through-screen velocity (yr 1) *Notes: Screen operation would be under criteria established by NMFS, FWS, and DFG. There may be some stranded costs if the point of diversion is moved sometime in the future. The facility would be operated for the following purposes:*
  - Improve survival of salvaged fish at the Tracy pumping plant
  - Reduce entrainment at the Tracy pumping plant
  - Provide valuable information for design of future fish facilities
6. Convert fish screen demonstration project at Tracy Pumping Plant to production facility and expand capacity if appropriate (yr 4-6).
7. Implement first increment of new south Delta fish screening and fish handling facility at the northeast entrance to Clifton Court Forebay [full module capable of screening 6,000 cfs at 0.2 through-screen velocity and 12,000 cfs at 0.4 fps through-screen velocity] (yr 2-6) ; *Notes: Screen operation would be under criteria established by NMFS, FWS, and DFG. There may be conflicts with higher pumping rates (e.g., over pumping screens or exporting water that is not first screened). Facility would be operated for the following benefits:*
  - Improve survival of fish in the south Delta near the State export pumping plant
  - Reduce predation of fish in Clifton Court Forebay
  - Reduce exposure of fish residing in or migrating through the central and south Delta to entrainment
8. Evaluate (and, if promising, pilot test) benefits/impacts of recirculation of a portion of Delta Mendota Canal flows through the Newman Wasteway to the San Joaquin River for water quality and ecosystem enhancement (yr 1-4).
9. Project environmental documentation and permitting for SWP/CVP intertie (yr 2-4).
10. Design and construct SWP/CVP intertie upstream of export pumps [tie Tracy Pumping Plant intake to Clifton Court Forebay] (yr 5-7+).
11. Implement joint point of diversion for SWP/CVP (This is a SWRCB permit action which would allow the SWP to pump CVP export flows and vice versa (yr 1-7).

**North Delta Improvements** - *North Delta improvements consist of a new screened diversion from the Sacramento River near Hood to the central Delta and significant channel modifications including setback levees. The screened diversion and associated*

*channels may be implemented in modular stages in order to resolve technical screening and fish passage issues at the appropriate scale. Stage 1 will focus on studies and design prior to construction. Selected channel improvements may be constructed but the majority of the improvements, if any are selected, will be constructed in Stage 2. These Delta channel improvements are the basic conveyance strategy of the preferred program alternative.*

1. Prepare project environmental documentation (yr 1-5).
2. Conduct feasibility studies for screened diversion and fish passage facilities, channel modifications, and habitat improvements (yr 1-5).
3. Conduct field studies (yr 1-5).
4. Prepare environmental documentation for land acquisition (yr 2-3).
5. Acquire land and convert land use for habitat and flood protection improvements (yr 4-6).
6. Obtain permits and operating agreements (yr 4-6).
7. Design selected improvements (yr 4-6).
8. Construct selected improvements including channel improvements such as setback levees, channel dredging, and waterside berms (yr 7).
9. Construct new Hood diversion test facility on the Sacramento River capable of diverting up to 2,000 cfs from the Sacramento River to the Mokelumne River (yr 4-6) *Notes: The facility would have an alignment that would be usable with potential future through Delta modifications or isolated facility. The facility would be operated for the following purposes:*
  - *Test screening efficiency, cleaning and bypass mechanisms*
  - *Test upstream passage mechanisms*
  - *Enable closing the Delta Cross Channel without compromising interior Delta and export water quality*
  - *Improve Delta water quality*
  - *Improve cues for migrating fish*
10. Pilot studies for dredge material reuse (yr 1-7).

**Isolated Facility** - *The isolated facility (a new canal or pipeline connecting the Sacramento River in the northern Delta to the SWP and CVP export facilities in the southern Delta) is not included in the basic Delta conveyance strategy. The following Stage 1 actions provide progress on initial studies in case the isolated facility is found necessary to meet CALFED objectives.*

1. Perform public health effects studies to more specifically identify the potential health effects of bromide related disinfection byproducts (yr 1-3).
2. Investigate alternative sources of high quality water supply for urban users of Delta water (yr 1-3).
3. Investigate advanced treatment technologies for the removal of salt, bromide, total

- organic carbon, and pathogens in urban water supplies (yr 1-3).
4. Investigate combinations of new supplies and technologies that can minimize salt content of urban water supplies and provide greater public health protection (yr 1-3).
  5. Convene an expert panel in a public forum to make recommendations to the governing entity regarding solutions to identified public health issues for urban users of Delta water (yr 4)
  6. Conduct the following actions as warranted:
    - Prepare project environmental documentation (4-7).
    - Conduct feasibility studies (yr 4-7).
    - Conduct field studies (yr 4-7).
    - Assess right-of-way issues that could impact CALFED's ability to maintain a viable option for a potential future habitat corridor (yr 4-7).

## Assurances & Institutional Arrangements

*An assurances package is a set of actions and mechanisms to assure that the Program will be implemented and operated as agreed. The assurances package will include mechanisms to be adopted immediately as well as a contingency process to address situations where a key element of the plan cannot be implemented as agreed. While the principles for the assurances package will be substantially complete before beginning Stage 1, many details remain to be finalized early in Stage 1 after the federal ROD and the state Certification.*

1. Finalize coordination among agencies or new entity (yr 1-3); e.g., provide for ecosystem restoration authority within the individual CALFED agencies or in a new organization with responsibility for ecosystem restoration.
2. Expand on the conservation strategy (yr 1-3); next steps will implement mechanisms that will provide regulatory certainty for specific projects or bundled projects whose actions were identified in the ROD for completion during Stage 1.
3. Recommend legislation, if necessary, to implement new institutional arrangements or facilitate program implementation (yr 2-3). Legislation could serve to create a new entity or modify water transfer law and statutes to facilitate an appropriately protective water transfer framework recognizing law that may exist at that time. For any legislation to implement new institutional arrangements that would facilitate increased water transfers out of the Delta, include reaffirmation and enhancement of existing laws such as the Delta Protection Act, the Feigenbaum Act, the Watershed Protection Act, and the Protected Areas Act ( Water Code §§1215, 1222, 1216, and 1217 [a]).
4. Incorporate the final State Board's water rights decision for allocation of responsibility to meet flow requirements for Water Quality Control Plan 95-IWR (May 1995) in water transfer and operational rules.



5. Implement a CALFED environmental documentation, mitigation, and permit coordination process (yr 1-7).
6. Implement and revise contingency response as needed (yr 1-7).
7. Develop guidelines and support legislation for federal Good Samaritan protections for mine remediation (yr 1-2).

## Finance

*The financial package will seek to finance the preferred program (total Program costs for improvements, mitigation, and ongoing annual operating and maintenance costs) through a combination of federal, state, and user funds. This financing will be needed over several decades as the various parts of the preferred program alternative are implemented, operated, and maintained. An agreement on the financial principles including the benefits-based approach, guidelines for public/user cost split, provisions for crediting for other parallel efforts, provision for repayment of federal/state costs where appropriate, and cost allocation methodology or strategy will be included in an implementation agreement prior to Stage 1. These principles will recognize public and private benefits derived from water quality, environmental protection, flood control, recreation, and a reliable water supply. Stage 1 establishes the financial package for use in all stages.*

1. Establish reliable short-term and long-term funding for each program element and for each package of Stage 1 actions (1-7):
  - Finalize cost-share agreements (yr 1).
  - Finalize appropriate user fees (yr 1-7).
  - Seek federal authorization/appropriation and seek authority to sell state bonds (yr 1-7).

## Monitoring, Research, and Adaptive Management

*Establish monitoring for all program elements that focuses on obtaining data on a timely basis, providing interpretation of data, and maintaining data in an accessible and useful form. The monitoring, assessment of data, and resultant need for adaptive management are required throughout the CALFED Bay-Delta Program. The first stage refines the monitoring system and procedures which will continue in subsequent stages.*

1. Periodic review and refinement of the monitoring plan (CMARP) including all elements of the Program (yr 1-7).
2. Define conceptual model of Delta watershed as it relates to fish survival and other indicators of ecosystem health. Include model variables for all significant

- stressors, such as diversion effects, commercial fishing, exotic species, hatchery impacts, and fish barriers on tributaries (yr 1).
3. Refine monitoring program based on conceptual model to acquire data needed to test model elements and guide investment strategy (yr 1).
  4. Define, review, and refine the adaptive management process for making adjustments as better information becomes available, including who makes future decisions, for all elements of the Program (yr 1-7); e.g., define triggers and time periods necessary for deciding need for change in management direction.
  5. Implement baseline monitoring plan under direction of a single umbrella entity as defined in CMARP with linkage to adaptive management process and provision for stakeholder input but provide for responsible agencies to conduct additional monitoring to meet their obligations in the event that needs cannot be met by baseline monitoring plan (yr 1-7).
  6. Review the isolated facility decision process as developed and refine adaptive management and monitoring programs as needed to accommodate the decision process needs (yr 1).
  7. Prepare annual reports on status/progress and need for adjustments (yr 1-7).
  8. Analyze status and need for adjustments of actions for stage 2 (yr 5-7).
  9. Complete monitoring studies identified by diversion effects on fisheries team to provide feedback on actual diversion effects of south Delta pumps (yr 2-7).
  10. Provide available data on need to reduce bromides, total dissolved solids, total organic carbon, pesticides and heavy metals (yr 5).
  11. Provide available data on water quality in south Delta and lower San Joaquin River (yr 1-7).
  12. Monitor and assess the impacts of water use efficiency measures on water demands and available supplies, and develop better information for water balances in the Bay-Delta system (yr 1-7).
  13. Expand real-time monitoring for enhanced fish protections and flexible operations for water suppliers (yr 1-7).

### 5.3 Water Operations

CALFED has extended the state and federal commitments in the Bay-Delta Accord to provide operational and environmental stability through December 1999.

**[\*\*\*Must be updated to reflect DEFT/NoName work when complete\*\*\*]** Work is progressing on evaluating potential Delta water operations criteria for use during Stage 1 implementation. A major concern in the south Delta is the effect of continuing exports, specifically entrainment and salvage of important fish species. To address this concern, CALFED is evaluating the concept of flexible operations. Flexible operations would allow reducing export pumping at times critical to fish and increasing export pumping at other times.

This will create risks to both water supply and the environment is consistent with the adaptive management approach.

Flexible operations will allow higher or lower export rates and export-to-inflow ratios than prescribed by the 1995 Water Quality Control Plan. Pumping could deviate from currently permitted rates seasonally and on a real-time basis in response to Delta flows and fish distributions. For example, the projects could reduce pumping when Delta inflow is low or when fish are present in large numbers and increase pumping when Delta inflow is high and few fish are present. An environmental water account might function to keep track of pumped and stored water that could become credits against pumping at critical environmental periods. The export rates could be altered for the following purposes:

- Reduce entrainment
- Improve foodweb productivity
- Protect fish migrating through the Delta
- Improve water supply reliability

Flexible operations has some potential negative effects:

- Impacts may shift to other species or life stages
- May locally impact water quality
- Potential loss of water supply reliability
- May reduce available water transfer conveyance capacity

The export rates would be managed [\*\*\* to be determined\*\*\*] in the following ways:

#### **Seasonally based on Real-Time Monitoring Response**

- **More restrictive at times**, providing greater environmental protection and reduced water supply
- **Less restrictive at times**, providing additional water supply and water for environmental benefit at later more critical periods
- **Shift high pumping to seasons of high flows**, especially high San Joaquin flows
- **Shift high pumping to seasons of low fish sensitivity**. Current requirements in the WQCP and Biological Opinions require seasonal adjustments in operations, modified by hydrological patterns. Further protection to allow recovery may need to expand on these tools. Seasonal shifts in operation may be most appropriate for conditions that occur predictably or where the times of sensitivity overlap for several species. Examples of such seasonal responses that the DEFT team has considered include: increasing the period of the Vernalis Adaptive Management Program from 31 to 60 days and relaxation of the Export/Inflow ratio to 75% in August and September

Operational changes [\*\*\* to be determined\*\*\*] would also include modifying flow volumes, distributions, frequency, and pathways. Flows may be changed by altering inflows, exports, barriers (e.g., Delta Cross Channel, Head of Old River barrier, Montezuma Slough salinity barrier, etc.). Proposed changes include:

- [\*\*\*development in progress\*\*\*]

## 5.4 Assurances and Governance

### Overview

CALFED's assurances package consists of a set of tools and mechanisms to assure that the Program will be implemented and operated as agreed. For some stakeholders, assurances also means a level of protection from the potential adverse impacts of program actions. The assurances package includes mechanisms to be adopted immediately as well as components for the long term, such as the conservation strategy and the contingency response process. While the principles of the long term assurances package will be substantially complete before beginning Stage 1, the details of some components will remain to be finalized during Stage 1. A more complete description of the draft Assurances Plan can be found in Attachment D.

The assurances package is an integral part of the implementation plan and includes assurance mechanisms which are program-wide and element-specific, internal and external, long term and short term. Internal assurances are those mechanisms which are integral to program actions, such as staging, linking and bundling (grouping) of actions together so they progress at the same time. External assurances are those tools which may be applied to the program, such as legislation, regulations, or contractual arrangements. Eventually, the assurances package will consist of several related components:

- A programmatic implementation plan or agreement
- Program wide assurances, including Program oversight and management
- Specific assurances for Program elements and actions
- Contingency response process

Over the long term, assurances will also be provided through the Conservation Strategy and the Comprehensive Monitoring Plan, both discussed elsewhere in this *Revised Phase II Report*.

### Stage 1 Assurances

Not all of the assurance components will be fully developed prior to beginning Stage 1 implementation. Therefore, CALFED and stakeholders will need to continue work in Stage 1 to complete the long term Assurances Package. In Stage 1, the following steps will be taken to develop the assurances package:

1. Finalize coordination among agencies or agreement on new entity for implementation of the ERP (yr 1-3).
2. Refine conservation strategy (yr 1-3); e.g., and develop mechanisms to allow incidental take, where necessary, for those actions identified in the ROD to be completed during Stage 1.
3. Recommend legislation, if necessary, to implement new institutional arrangements or facilitate program implementation (yr 2-3).
4. Incorporate the final State Board's water rights decision for allocation of responsibility to meet flow requirements for Water Quality Control Plan 95-IWR (May 1995) in water transfer and operational rules (yrs 1-2).
5. Implement an environmental documentation and permit coordination process (yr 1-7).
6. Implement and revise contingency response as needed (yr 1-7).

Assurances in Stage 1 are in many cases provided in the way that actions have been selected and proposed for implementation, and by linkage and integration with other Stage 1 actions. An example is an action to establish the Clearinghouse in the Water Transfer Program which is proposed as an assurance that water transfer transactions and potential impacts will be fully disclosed.

The concept of linkage provides that actions of one element will not be implemented unless linked actions in a different element are also implemented. Bundling (grouping) refers to the idea of putting actions from different program elements into one project for purposes of CEQA/NEPA compliance, contractual relationships, or other permit requirements. Thus, no one set of actions from a particular element would be implemented without counterpart actions from other elements also being implemented.

Assurances will also be provided by conditional decision making. A decision is conditional if it can only be made after a specific set of events has occurred or specified criteria have been met.

Additionally, since in Stage 1 the program is dealing with short-term implementation efforts (perhaps of 2 or 3 sets of bundled actions over a seven year time frame) there will be frequent and periodic checkpoints at which parties can determine whether the program is meeting their needs and expectations. Effectively, the commitment of all interested parties will not have to be any longer than the current set of bundled actions requires for permitting and implementation. This reduces the need to develop long term assurances prior to the beginning of Stage 1.

## Program Management and Governance

There are two distinct assurance questions related to program management and governance. First, how will the program as a whole be implemented, managed and governed? (Is CALFED the appropriate entity for program management and is the structure adequate or is a new arrangement needed?) Second, how will the ERP specifically be governed and managed? The working premise is that CALFED will continue to function as the general Program manager and provide oversight and policy guidance for program implementation. A major oversight function will be to determine when program implementation milestones or performance measures have (or have not) been achieved and making the necessary reports or findings so that the program can move on to the next stage of implementation. Other oversight functions will include development of program budgets, project prioritization, and inter agency coordination. Also, CALFED will be called upon to make the necessary decisions and program adjustments due to unforeseen or uncontrollable events, as described in the contingency response process.

However, experience with the existing structure suggests that there are problems, which need to be resolved in order to assure that the CALFED program is successfully implemented. Some of these problems include:

- **Planning versus Implementation** - CALFED was created specifically to create a long-term plan. However, plan implementation poses significant new challenges that the current arrangement was not designed to deal with. These involve potentially much larger cash flows, addressing demanding implementation schedules, interacting with affected stakeholders, local entities, and regulatory issues in new ways, and potentially greater legal liabilities.
- **Program Administration** - CALFED does not exist as a legal entity; it has no independent power to receive appropriations, hire staff, establish a location for housing the Program issue contracts, and other basic administrative functions. This will affect its long-term ability to develop a coherent program, and carry out its duties in an efficient manner.
- **Decision Making Protocol** - CALFED, as an ad-hoc planning entity, has not established a permanent decision-making protocol. While it is generally agreed that participating agencies will not give up any independent decision making authorities to a CALFED governance entity, this leaves a broad range of Program policy and implementation issues on the table for resolution as the Program moves forward. It is likely to become increasingly important to resolved issues in a clear and unambiguous way through a formal consensus process, majority rule, or other option.
- **Decision Making Responsibility and Input** - CALFED currently receives input

through a wide variety of pathways, including the Bay Delta Advisory Council and its work groups. There is a need to review and potentially modify the input process to address stakeholder concerns regarding overall Program governance. The water policy decisions CALFED is working to resolve are also addressed in the legislative process, with a great deal of both formal and informal interaction between the two. Stakeholder participation at the program level can be provided by a new or reconstituted advisory committee such as BDAC. This role could be expanded from its current limited advisory capacity to more active involvement in making findings necessary to advance the program to the next stage or in preparing and adopting reports to the Legislature and/or Congress.

Many stakeholders believe that the best means of assuring the achievement of environmental improvements in the Bay-Delta system is to endow an environmental trustee with the financial means, legal rights, authorities, and discretion needed to carry out the CALFED ecosystem program. At the same time, the regulatory authorities of existing agencies to protect the ecosystem will not be weakened or altered. The creation of such an environmental trustee could increase accountability, simplify decision making, encourage environmental efficiency, assure flexibility, and expand participation.

### **Specific Stage 1 Program Element Assurances**

In addition to the usage of linked and bundled actions as an assurances mechanism, each of the major program component or elements requires some more specific assurances. These are summarized in Attachment E.

### **Contingency Response Process**

The contingency response process is to be used when elements of the solution cannot be implemented or operated as agreed. It can provide an accountable process that promotes appropriate actions by program managers when contingencies or potentially damaging circumstances affect program functions. It would be designed to minimize program disruption, while at the same time keeping agreed upon linkages and conditions in place. A graded response process is proposed, with corrective actions for minor contingencies, significant disruptions, and catastrophes. These responses are summarized in the following table.

Category	Effects/Outcomes	Response Process
<b>Minor</b>	Has negligible effect on Program implementation or operation and/or Confined to single program element with low risk of affecting others and/or Requires only minor and/or temporary changes in implementation or operation of affected element	Delegated to lowest appropriate decision maker. Immediate response and resolution as deemed appropriate by decision maker. Notification to other Program managers as appropriate.
<b>Significant</b>	Will prevent achieving element objectives and/or May immediately affect more than one element or has potential to affect more than one element if not resolved and/or May immediately or eventually affect Program implementation or operation and/or Requires significant changes in implementation or operations on either temporary or permanent basis	If one element affected, delegated to highest appropriate decision maker in charge of implementing that element. If more than one element is affected, oversight entity will resolve. Notice to all Program managers and other affected parties. Written notice of resolution of outcome to all managers, Program administration and affected parties.
<b>Catastrophic</b>	Immediately halts Program implementation or operations and/or Requires changes in Program policies in order for Program to go forward	Formal process Early public notice Public hearings Stakeholder involvement Written findings
<b>Emergency</b>	Sudden, unexpected occurrences that pose imminent loss or damage to life, health, safety, property or essential public services and/or Requires immediate suspension of Program operations	Immediate notification of appropriate emergency management organizations. Delegated responsibility within Program to coordinate with emergency mgmt. organizations



## 5.5 Financing Plan

The Financial Strategy is a conceptual plan for funding the implementation of the preferred alternative CALFED Bay Delta Program (Program). This is a summary report on the development of the Financial Strategy that briefly identifies financing principles, cost allocation and cost sharing considerations, and Program element cost estimates. More detail on the financial strategy is contained in Attachment F to this report. This report is not exhaustive and is intended to advance discussions on financing for Program implementation and thus will continue to be revised to reflect agency and stakeholder input.

### Financial Issues and Principles

The financial issues and principles address public and user beneficiaries cost splits, ability to pay, crediting for previous or ongoing efforts concurrent with Program goals, establishment of the financial baseline, and allocation of program costs.

### Benefits-Based Allocation

Sharing the costs of implementing the preferred alternative based on the benefits being created is the cornerstone principle of the CALFED Financial Strategy. The fundamental philosophy is that costs will be paid by the beneficiaries of the actions, as opposed to seeking payment from those who, over time, may have been responsible for causing the problems being experienced in the Bay Delta system. This does not preclude obligations for mitigating harmful impacts, if a direct, ongoing, cause and effect relationship can be established.

### Public-User Splits

During Phase I of the Program, it became apparent that both public and user investments are necessary to fund the long term Program implementation. The public and user categories have also been extended to describe the character of certain types of benefits which may be produced, with an eye towards which source of funding will pay for which portions of the Program. In principle, public money will be used to fund actions which provide public benefits, and user money will be used to fund actions which create user benefits.

In addition, a broad-based revenue source will be needed to fund the common programs with broad-based, but not necessarily public, benefits. A water diversion fee(s) is proposed that would provide a non-public revenue stream to supplement public funding for the Program Elements.

### Ability to Pay

Users unable to pay the full costs of benefits received can potentially be subsidized by others or can be excluded from receiving those benefits. In accordance with CALFED's "beneficiaries pay" principle, users should pay their full share. On the other hand, there are many precedents for considering ability to pay, and apportioning cost allocations accordingly, because this approach can help meet broader social goals of economic justice, social health and welfare, economic development, and stability which arguably benefit society as a whole. Such deviations from the beneficiaries pay principle should be explicitly identified and justified.

### Crediting

Users who are actively moving forward with actions to benefit the Bay-Delta system have suggested that costs of these actions should be credited against their ultimate cost share of the Program. An interim policy granting credit for cash contributed to the Category III Program has been approved by CALFED, because it was initiated as part of the Bay-Delta Accord and can be clearly identified in scope, source of funds, and benefits.

In principle, the crediting policy should be expanded to reflect payments toward other consolidated efforts to address CALFED Bay-Delta ecosystem issues. CALFED proposes that credit will be given for funds expended on programs with efforts parallel to ERP actions, after the signing of the Bay-Delta Accord, on December 15, 1994. As a general rule, funding commitments that were made before the signing of the Bay-Delta Accord would be considered part of the no-action alternative, and would be exempt from receiving credit. One exception may be the CVPIA Restoration Fund, which the BDAC Finance Work Group agreed in principle should receive credit for payments that occurred post-Accord and contribute to the CALFED Program. As part of the long-term crediting policy, many additional details must be agreed upon, including types of payments to be credited, methods of crediting, consideration of the timing of payments, and others.

### Financial Baseline

There is a wide spectrum of views as to how the costs of the ERP should be shared that is based in part on differing views as to the starting point or "baseline" from which ecosystem improvements should be viewed. If such a baseline level were known, then restoration to that baseline level could be considered mitigation for past acts, while restoration above the baseline level could be considered enhancement to the ecosystem.

CALFED proposes that the baseline will begin with the signing of the Bay-Delta Accord on December 15, 1994. This date is consistent with the proposed starting date for crediting. Any

detrimental actions taken prior to this would be considered past acts, and anything subsequent to the signing of the Accord would be viewed as ongoing impacts. As a CALFED principle, the benefits-based approach means that any obligations for mitigation should be limited to ongoing direct impacts, as opposed to historical impacts. Mitigating current and future impacts of existing projects is a responsibility of those who derive benefits from the projects.

## Cost Allocation Methods

No policy decisions have yet been made regarding the specific cost allocation techniques to use for making detailed cost allocations for program benefits. However, some CALFED agencies have historical policies relating to cost allocation techniques. Within the stakeholder community, some feel that while traditional methodologies may be applicable for conventional facilities, they may not be appropriate for use with the Program elements due to the difficulty of including non-market benefits created by the Program elements in the allocation process.

There are many possible cost allocation methods, each with its own strengths and weaknesses. There is no single best method that addresses all of the criteria in an optimal way. The remaining issues that must be resolved with respect to cost allocation relate to selection of specific methods to use, and whether allocation should take place at the level of Program as a whole, individually for each program element, or some other subset of the Program.

## Cost Estimates

A first-cut attempt at estimating the costs of the program for Stage 1 (first 7 years) is included here, but it is a rough estimate of costs, not a detailed or final report on costs. In addition, the Federal/State/User cost share in this table is an example of what a final cost share might look like, but does not reflect a policy or proposal by CALFED for cost sharing for the Program. The cost estimates in Table 1 exclude interest, inflation, O&M, individual State and Federal agency costs, and CALFED (or other coordinated entity) management/ overhead costs. More detailed information on cost estimates for the Program can be found in the Financing Plan Appendix to this report.

**ESTIMATED CALFED STAGE 1 PROGRAM AND CAPITAL COSTS IN MILLIONS<sup>1</sup>**

<b>PROGRAM AREA<sup>2</sup></b>	<b>STATE</b>	<b>FEDERAL</b>	<b>USER</b>	<b>TOTAL</b>
Ecosystem Restoration <sup>3</sup>	390	375 <sup>4</sup>	200	965
Conservation	100	100	600	800
Recycling	250	250	500	1,000
Watershed Management	70	70	130	270
Water Quality	85	85	80	250
Delta Levees <sup>5</sup>	80	140	30	250
Storage (off-stream, on-stream & conjunctive use)	70	50	110	230 <sup>6</sup>
Conveyance	190	200	285	675 <sup>7</sup>
<b>TOTAL</b>	<b>1,235</b>	<b>1,280</b>	<b>1,925</b>	<b>4,440<sup>8</sup></b>

1 The Federal/State/User cost shares are for discussion purposes only. The costs should first be allocated before cost shares can be represented accurately.

2 Includes all CALFED program areas except Water Transfers which has no anticipated capital costs.

3 This includes Prop. 204 (State), Federal Bay-Delta appropriation and CVPIA water and energy funds (Federal), and CVPIA Restoration Fund (User) for seven years. A policy issue exists regarding the need for expanded user fees to pay for future ecosystem restoration and Watershed Management.

4 CVPIA water and energy funds are the only pre-existing federal and/or state programs included in this table.

5 The Delta Levees cost share is consistent with the Water Development Act of 1996 (PL 104-303, Sect. 202), the pre-existing federal cost share for flood control.

6 Includes South of Delta groundwater (145), North of Delta groundwater (15), surface storage pre-permitting and EIR/EIS compliance work only (70).

7 Includes South Delta Improvements (408), North Delta Improvements (195), Isolated Facility studies (72).

8 CALFED (or other coordination entity) management/overhead costs and other State and Federal agency costs are not included. O&M and interest are also not included.

## 5.6 Comprehensive Monitoring, Assessment and Research Program (CMARP)

### Introduction

The CALFED Bay/Delta Program is organized around the concept of adaptive management because there is incomplete knowledge of how the ecosystem functions and the effects of individual project actions on populations and processes. Monitoring key system functions (or indicators), completing focused research to obtain better understanding, and staging implementation based on information gained are all central to the adaptive management process. The process necessarily includes numerous assessment and feedback loops so that management decisions are based on the best and most current information. This process entails an institutional framework to ensure that the correct questions are identified for monitoring and research actions, that monitoring and research are conducted appropriately, that the data collected and obtained are stored properly and available to those with an interest, and that relevant information is developed from the data obtained to further the incremental process of adaptive management. The Comprehensive Monitoring, Assessment and Research Program (CMARP) has been charged with developing recommendations to meet these needs. CMARP recommendations will be presented to the CALFED Policy Group in February 1999.

### Scope

The scope of CMARP includes all of the CALFED Bay/Delta common program elements (i.e., ecosystem restoration, water quality, watershed management, levee stability, water transfers and water use efficiency), as well as other CALFED programs including restoration coordination and the Conservation Strategy. The CMARP scope also includes the monitoring assessment and research needs of CALFED member agencies. The recommended CMARP will include organizational options to ensure that monitoring, assessment, and research needs are:

- Identified
- Coordinated to provide comprehensive system-wide coverage
- Performed by the most appropriate party
- Completed in a comparable manner by all parties
- Accomplished with minimum redundancy and optimum efficiency and effectiveness

The CMARP must also ensure that results from the monitoring are:

- Interpreted

- Made readily available to all interested parties in a timely manner
- Incorporated as feedback to facilitate adaptive management

The scope of CMARP includes both institutional and environmental considerations. It seeks to balance specific knowledge needs of water managers and the public versus an understanding of ecosystem processes and what can actually be obtained and measured from the field. For example, CALFED agencies presently monitor the abundance of several key species and environmental attributes such as streamflow at the State and federal diversion facilities in the Delta to understand better what is entrained, when, how many, during what life stage and under what kind of environmental conditions. Although much of this monitoring is designed to address institutional needs, limits on knowledge obtained are based on limitations of monitoring design which in turn are limited by the physical system to be monitored. Thus, the programmatic scope of a monitoring and research program must consider both institutional needs and environmental considerations and should maintain sufficient flexibility to respond to both as they change over time.

CALFED has determined that monitoring, assessment, and applied research efforts are a critical component of the adaptive management process, and should be integral to all program elements. The application of CMARP will be very different for individual CALFED programs. However, each program element has similar needs that include gathering and assessing data. In addition, the CMARP must also address the monitoring and assessment needs of the CALFED Conservation Strategy, as well as any mitigation required as a result of CALFED program actions.

Restoration coordination projects require special consideration. A requirement for restoration coordination funding is that project proposals contain monitoring elements to determine if stated objectives have been met and to provide guidance for assessing future rehabilitation needs. CMARP will include recommendations to ensure that monitoring data from all these projects are technically sound, broadly usable, and provide meaningful information to guide future actions.

From a CALFED agency perspective, the comprehensive program includes such disparate activities as real-time monitoring of fish distribution, compliance water quality monitoring, the Vernalis Adaptive Management Program, levee integrity evaluation, and a number of special monitoring and research projects related to each agency's mission.

The CMARP Plan will take into consideration the broad variety of factors that can affect the environment, its physical structure, chemical makeup and biotic communities. The recommended program will necessarily be limited to monitoring only a small fraction of the possible physical chemical, and biological, attributes of the environment. Conceptual modeling will play a key role in helping decide which attributes to monitor.

## Objectives

Objectives have been established for CMARP's monitoring and assessment and research functions that are consistent with the primary CMARP goal of supporting the general CALFED structure, and in particular the adaptive management strategy adopted by CALFED.

### Monitoring and Assessment Program Objectives

1. Provide information necessary to management necessary to evaluate the effectiveness of program actions and to support ongoing adaptive management actions
2. Describe conditions in the Bay-Delta and its watershed on appropriate temporal and spatial scales
3. Evaluate trends in the measures of environmental conditions
4. Identify the major factors that may explain the observed trends
5. Analyze data and report results to stakeholders and agencies on a timely basis

### Research Program Objectives

1. Build an understanding of physical, chemical and biological processes in the Bay-Delta and its watershed that are relevant to CALFED program actions
2. Provide information useful in evaluating the effectiveness of existing monitoring protocols and the appropriateness of environmental attributes
3. Test causal relationships among environmental variables identified in conceptual models
4. Reduce areas of scientific uncertainty regarding management actions
5. Incorporate relevant new information from all sources
6. Revise conceptual models as understanding of the system increases

## Program Activities

The CMARP development process involves the completion of several specific tasks involving activities shown below. Accountability and efficiency are critical components of the overall program.

1. **Identify the goals, objectives and needs** of CALFED Common Programs, Related Programs, and Agency Major Program Goals and Objectives.
2. **Develop a conceptual framework** that focuses on development of explicit conceptual models for use in designing monitoring and research programs. (This task is being accomplished in coordination with monitoring and research

programs from Puget Sound, Chesapeake Bay and South Florida).

3. **Monitoring program design**
  - Inventory existing monitoring programs
  - Develop monitoring elements (There are 6 elements and 13 sub-elements)
  - Develop a process for data management
  - Develop a process for data analysis and monitoring
  - Restoration coordination monitoring institutional process
4. **Design a CALFED focused research program** to investigate causes and trends, reduce areas of scientific uncertainty, and corroborate relationships in conceptual models.
5. **Develop an institutional structure for monitoring, assessment and research** to focus on identifying institutional functions, recommend how a monitoring and research program should operate, determine funding, establish accountability, and identify its relationship to CALFED.

CALFED recognizes the need for reducing uncertainties about the factors affecting the resources of the Bay-Delta system. Although a traditional monitoring, assessment and research program will meet this need over a period of decades, CALFED needs to reduce key uncertainties at a more rapid rate to meet program goals. Therefore, CALFED will undertake an active program of adaptive resource management. Such a program will require a partnership between resources managers and scientists in which effects of key factors are better defined by informed management experiments. Resource managers will thereby increase chances of avoiding catastrophes and responding successfully to unexpected events. Informed adaptive experiments require policy-level recognition and acceptance of some risks to the resources.

## 5.7 Adaptive Management

No long term plan for management of a system as complex as the Bay-Delta can predict exactly how the system will respond to Program efforts or foresee events such as earthquakes, climate change, or the introduction of new species to the system. Adaptive management, as an essential Program concept, acknowledges that there is a need to constantly monitor the system and adapt the actions that are taken to restore ecological health and improve water management. These adaptations will be necessary as conditions change and as more is learned about the system and how it responds. The Program's objectives will remain fixed over time, but the actions may be adjusted to assure that the solution is durable.

The concept of adaptive management is an essential part of every CALFED Program element, as well. The concept of adaptive management can be illustrated as applied to the Ecosystem



Restoration Program element as shown in the following section.

Because the Bay-Delta ecosystem is large, complex, diverse and variable, it is impossible to know with certainty how it will respond to implementation of the ERP and other Program components. And although much is known about how the Bay-Delta functions, there are still significant information gaps that hamper the ability to sufficiently define problems and design restoration actions to address them. To account for this uncertainty, the ERP strategic plan outlines an adaptive management approach to restoring and managing the Bay-Delta ecosystem. An adaptive management approach acknowledges the uncertainty inherent in restoring and managing a natural system as large and complex as the Bay-Delta by designing and monitoring restoration actions so that they improve the understanding of the system while simultaneously restoring it. This approach allows revised restoration activities or better designed future restoration actions based upon the information learned from projects implemented earlier. It also provides the flexibility required to respond to changing Bay-Delta conditions and to identify and address resource conflicts and trade-offs. The Strategic Plan outlines the following steps as part of the adaptive management approach:

1. **Define the problem or set of problems to be addressed.** In order to design effective restoration actions, the geographic, temporal, and ecological parameters of the problem must clearly be defined. Decades of scientific study have already identified many of the problems affecting the health of the Bay-Delta ecosystem. However, for certain components of the Bay-Delta ecosystem, existing knowledge is insufficient to adequately define problems, so targeted research will be necessary to provide the information that allows the problems to be defined with greater detail.
2. **Define goals and objectives for resolving identified problems.** It is important to establish the expectations of the overall restoration program and for individual restoration actions by articulating clear restoration goals. It is also important to establish the criteria that can be used to measure success in achieving goals by defining measurable objectives. Clear goals and measurable objectives help focus and direct ecosystem restoration, they help facilitate the design of restoration actions, and they help resource managers track incremental progress toward restoration objectives.
3. **Develop conceptual models.** It is impossible to account for all of the variables that compose and animate an ecosystem as large and complex as the Bay-Delta; therefore, it is necessary to distill the most important ecosystem attributes and relationships into simplified models that can guide resource restoration and management. Conceptual models articulate hypotheses about what attributes and relationships are most important in an ecosystem. By articulating hypotheses

about causal relationships in the ecosystem, conceptual models can suggest potential restoration actions or identify critical information gaps that help target additional research.

4. **Develop and design alternative restoration or management actions.** Conceptual models will provide an assessment of the confidence we can place in potential restoration actions. For those actions about which there is confidence in how the ecosystem will respond, full-scale implementation can begin. If conceptual models suggest multiple viable restoration alternatives, pilot or demonstration projects to test the alternative hypotheses could be implemented. The resulting information will improve understanding of the ecosystem and help suggest which restoration actions are most effective in achieving restoration goals. Conceptual models can also help identify information gaps and needed targeted research.
5. **Implement restoration actions.** Restoration actions selected for implementation must address the more serious environmental problems, must be linked to conceptual models, and must provide an opportunity to enrich our knowledge of how the ecosystem operates.
6. **Monitor the ecosystem.** It is important to monitor the ecosystem to gauge how it responds to the restoration or management action. Monitoring provides the information necessary for assessing the effectiveness of a given restoration action. It also provides the data that will help improve understanding of the Bay-Delta ecosystem.
7. **Update restoration and management actions.** The information derived from monitoring data allows resource managers to evaluate restoration actions and revise or update them to be more effective in achieving restoration goals and objectives. Monitoring data can also indicate when there is a need to refine the definition of a problem or the goals and objectives.

Similar models of these seven steps can be used to develop adaptive management approaches for the other program elements.

## 5.8 Long-Term Implementation

The long-term implementation plan will include a general plan (subject to adaptive management and the conditional decisions) for the 30-year Program implementation. The plan will also consolidate the above information relating the finance package, water operating rules, governance and assurances, Stage 1 actions, conditions and linkages, and detailed

implementation plans for each program element. The plan will contain performance measures for each of the program elements.

[\*\*\*need to expand on general vision for continuing over 30-years; complete the 8 program elements subject to adaptive management\*\*\*]

## 5.9 Draft Stage 1 Environmental Compliance Strategy

CALFED's Phase III actions will involve regulatory oversight from a number of federal, state and local government agencies. Although a programmatic EIS/EIR is being prepared, most of CALFED's proposed actions will require additional environmental documentation and permitting before they can be implemented. Effectively implementing CALFED actions will require efficient processing of information needed to comply with the regulatory procedures of the different agencies and their protocols, guidelines and time lines. Just as importantly, regulatory agencies, at the local level, will need to work with CALFED staff to identify and ultimately implement opportunities which assure conformance with their regulatory procedures while meeting the requirements in a more timely and efficient manner.

CALFED proposes to develop an environmental compliance strategy which assures compliance with various regulatory requirements, such as the National Environmental Policy Act, California Environmental Quality Act, State and Federal Endangered Species Acts, Sections 401 and 404 of the Clean Water Act, National Historic Preservation Act, Coastal Zone Management Act, in a timely and efficient fashion so as to not cause unnecessary delays or preclude scheduled implementation. The strategy will be used to implement both individual actions and actions which have been bundled.

The environmental compliance strategy assumes:

1. Regulatory agencies will fulfill their jurisdictional responsibilities
2. Projects will be required to be comply with each agency's regulatory requirements
3. Regulatory agencies are receptive to undertaking a coordinated approach to issuing permits in a timely and efficient fashion

## 6. OTHER CONTINUING/FUTURE WORK EFFORTS

### 6.1 Summary of Regulatory Compliance

The March Draft Programmatic EIS/EIR described how the CALFED Bay-Delta Program proposes to achieve programmatic compliance with several federal and state laws. Specifically, the CALFED Program proposes specific actions to comply with the programmatic requirements of the National Historic Preservation Act; the Memorandum on Farmland Preservation and the Farmland Protection Policy Act; the Federal Agricultural Improvement and Reform Act of 1996 and the 1985 Food Security Act; Executive Orders 11988 (Floodplain Management), 11990 (Protection of Wetlands), and 12898 (Environmental Justice); the Federal Clean Air Act; and the Federal Climate Change consideration under NEPA. Chapter 11 of the Main Document of the March Draft Programmatic EIS/EIR contains additional information regarding compliance with applicable laws and regulations.

Chapter 11 outlined programmatic compliance actions that still need to be initiated before the Final Programmatic EIS/EIR is completed. This section indicates how the CALFED Bay-Delta Program plans to comply with the federal/state Endangered Species Acts; Fish and Wildlife Coordination Act; 404(b)(1) Guidelines (Clean Water Act); and the Coastal Zone Management Act. Further compliance steps will be taken by agencies carrying out specific projects in Phase III.

#### Federal/State Endangered Species Acts

The Program is developing a programmatic Species and Habitats Conservation Strategy (Strategy) for compliance with the Federal and State Endangered Species Acts and the California Natural Community Conservation Planning Act. This Strategy will integrate all of CALFED's ecosystem restoration and mitigation actions, and provide a framework for site- and project-specific compliance with the Acts. The Strategy will prescribe conservation actions for species and habitats which will increase certainty that Program actions can be implemented.

The Strategy will address a list of covered species, including all Federally and California listed, proposed, and candidate species that may be affected by the CALFED Program. The list of covered species also includes other species identified by CALFED that may be affected by the Program and for which adequate information is available. The Strategy's covered species list currently includes 206 species that occur in the Ecosystem Restoration Program's 14 Ecological Zones. Life history information is being compiled for each of the species, including, but not

limited to, current population status, distribution and habitat requirements.

The Strategy will analyze the effects of CALFED programmatic actions (beneficial, detrimental, and neutral) on the covered species and recommend measures to maximize the Program's beneficial effects, minimize the Program's adverse effects, and compensate for any unavoidable adverse effects. The Strategy will also address the protection and restoration of habitats and ecological processes within the area directly affected by the CALFED Program. Further, the Strategy will include a monitoring program, specify a process for adaptive management, and address funding for implementation of the Strategy and for addressing unforeseen circumstances.

The Strategy will not in and of itself provide "take" authorization under Federal Endangered Species Act (FESA) or the California Endangered Species Act (CESA). Rather, the Strategy will contain the necessary biological information, programmatic impact analysis and conservation measures such that the regulatory agencies can authorize incidental take through one of the following regulatory mechanisms:

- a) Under FESA: formal consultation pursuant to Section 7; permit issuance pursuant to Section 10(a)(1)(B), including the development of one or more habitat conservation plans; and/or a special rule for threatened species under Section 4(d)
- b) Under CESA: permit issuance under Section 2081
- c) Under the NCCP: through Section 2835, including the development of a natural community conservation plan

During implementation of Stage 1 actions, either the USFWS, the NMFS, or the CDFG will authorize incidental take for Stage 1 actions under the CALFED program when adequate information is available to assess the action's effects on listed or other covered species.

## **Fish and Wildlife Coordination Act**

Under subsection 2(a) of the Fish and Wildlife Coordination Act (FWCA), federal agencies are responsible for consulting with the USFWS and the Department of Fish and Game for the purpose of conservation of wildlife resources by preventing loss and damage as well as providing for their development and improvement in connection with water-resource projects. Also within subsection 2(b) of the FWCA, the USFWS is required to report its recommendations for wildlife conservation and development and the results expected, and to describe the damage to wildlife attributable to the project and the measures proposed for mitigating or compensating for these damages.

For the programmatic FWCA report, the USFWS will provide the public with their overall

assessment of the effects of the CALFED Program and alternatives on fish and wildlife resources, providing recommendations for mitigation of adverse effects (where appropriate), and providing recommendations for implementing future (Phase III and beyond) CALFED Program actions.

The USFWS, as a member agency of the CALFED program, has provided technical assistance to the Program throughout the development of the preferred program alternative. The USFWS will complete this programmatic FWCA analysis and report its findings and recommendations prior to completion of a Final Programmatic EIS/EIR for the CALFED Program. That report will become a part of the Final Programmatic EIS/EIR.

The USFWS will continue to provide technical assistance during Program implementation. Analyses of effects on fish and wildlife will also be provided for applicable Program actions as they are being planned.

## Clean Water Act Section 404

Section 404 of the Clean Water Act requires that a project proponent obtain a permit from the U.S. Army Corps of Engineers for activities that involve the discharge of dredged or fill material into waters of the United States (33 USC 1344). A 404 Permit is not required for Phase II of the Program process because no projects will be started. However, because implementation of the program will require that projects are constructed, the Program analyzed the three alternatives and the variations in light of Section 404 and used those analyses to help select a preferred alternative.

The Corps of Engineers has determined that the level of detail in the programmatic EIS/EIR for the CALFED preferred alternative will not establish a sufficient basis for a final determination of compliance with Section 404 at the time of the Record of Decision at the beginning of Stage 1. In order to facilitate Section 404 permitting during Stage 1, however, the Corps of Engineers, USEPA, the State of California, and CALFED staff are exploring several options. These include:

- The possibility of an early permitting process for those projects included in the first "bundles" of CALFED actions in Stage 1.
- The possibility of developing a broad "programmatic" evaluation of the need for surface storage or conveyance facilities in the CALFED Program. Identifying this needs analyses could allow for a more expedited and limited 404 permit evaluation when particular projects apply for site-specific permits.

## The Coastal Zone Management Act

Under the Coastal Zone Management Act of 1972, coastal states are required to develop coastal zone management programs, and federal agencies are required to certify that any proposed activities within or affecting the coastal zone are consistent with the state's program. In California, the San Francisco Bay Conservation and Development Commission (BCDC) oversees the San Francisco Bay segment of California's coastal zone management program. Among other areas, BCDC also has permit jurisdiction over projects within certain waterways up to, but not including, the legally-defined Sacramento-San Joaquin Delta (east of Chipps Island) that empty into the Bay and within specific saltponds and managed wetlands.

For Phase II, the Program will prepare a Programmatic Coastal Zone Management Act Consistency Determination which will document the possible effects of the Preferred Program Alternative on coastal resources. The Consistency Determination will also document the actions that the Program will take to ensure that implementation of the Preferred Alternative is carried out in a manner consistent, to the maximum extent practicable, with CZMA and the Coastal Act. Since the March 1998 Draft Programmatic EIS/EIR did not contain a Preferred Program Alternative, the Programmatic Coastal Zone Management Act Consistency Determination for the CALFED Bay-Delta Program was not submitted to BCDC. This document will be presented to BCDC and be part of the Final Programmatic EIS/EIR.

## Clean Water Act Section 303

Section 303 of the Clean Water Act requires all states to conduct triennial reviews to evaluate and, where necessary to protect the designated uses for the state's waters, revise water quality standards. In California, the State Board is the recognized entity responsible for implementing the triennial review process.

The triennial review process of Section 303 is particularly well-suited to the adaptive management approach to ecosystem protection being proposed in the CALFED Program. CALFED intends to work with the State and Regional Boards and the USEPA to assure that the implementation of the Ecosystem Restoration Program and other CALFED programs is consistent with and, where appropriate, incorporated into the ongoing regulatory programs based on Section 303.

## 6.2 Restoration Coordination

In December 15, 1994, the Bay-Delta Accord included a commitment by the agency and stakeholder signatories to develop and fund non-flow related ecosystem restoration actions to improve the health of the Bay-Delta ecosystem. This commitment is commonly referred to as *Category III*. Some of the specific non-flow factors identified to be addressed as part of the Category III commitment include unscreened water diversions, waste discharges and water pollution prevention, fishery impacts due to harvest and poaching, land derived salts, exotic species, fish barriers, channel alternations, loss of riparian wetlands, and other causes of estuarine habitat degradation.

Category III actions can be beneficial to the long term program regardless of the final configuration of the preferred program alternative. The Category III actions must be consistent with any alternative configuration and provide early implementation benefits. This implementation will also provide valuable information for use in adaptively managing the system in later years of the program. Category III projects must have appropriate environmental documentation, have no significant adverse cumulative impacts, and must not limit the choice of a reasonable range of alternatives.

Funding sources for near-term restoration activities include \$60 million from state Proposition 204 funds (Bay-Delta Agreement Program) and stakeholder contributions of \$31.75 million. In addition, Congress authorized \$430 million for fiscal years 1998, 1999, and 2000 to fund the Federal share of Category III and initial implementation of the ERP. In Federal fiscal year 1998, \$85 million was appropriated and in Federal fiscal year 1999, \$75 million was appropriated for Bay-Delta ecosystem restoration, a portion of which is considered Category III funding. Proposition 204 also include \$390 million for implementation of the ERP.

Projects have been selected through a 1997 Request for Proposals which resulted in the selection of 71 projects totaling more than \$85 million, through selection of twelve directed programs targeted at specific issues to be addressed by individual CALFED agencies, and through a 1998 Proposal Solicitation Package which resulted in the selection of 64 projects totaling over \$25 million. Competition has been fierce for these funds and the number of applications regularly exceeds the available funding by 10 to 1.

About three-fourths of the money was devoted to projects that restore rivers, riparian forests, wetlands, and marshes. The remainder has gone to projects such as installing fish screens to keep endangered fish from being pumped out of rivers; preventing the introduction of exotic species; and researching key questions that must be answered to implement adaptive management. Many of the ecosystem projects also provide benefits to other CALFED objectives such as water supply reliability, levee system integrity, and water quality.



As the CALFED long-term program has become more developed, the priorities and the project selection process have been revised to ensure that expenditures are consistent with the overall direction of the program and efficiently targeted at restoring the ecosystem through adaptive management.

### 6.3 Phase III Site-Specific Environmental Documentation

During Phase III of the CALFED Program, second-tier site-specific environmental documents will be prepared for the individual actions or site-specific projects chosen for implementation during the current Phase II process. Second-tier documents, will be prepared after certification of the Programmatic EIS/EIR to concentrate on issues specific to the individual parts of the program elements being implemented or the site chosen for the action. The second-tier documents will summarize and incorporate by reference the issues discussed in the broader program-oriented EIS/EIR and focus on the issues specific to the part of the overall program being implemented. Information presented in the second-tier EIS/EIRs will be specific to a smaller area within the CALFED Bay-Delta study area and will focus on impacts within the smaller area and individual action-level mitigation performance criteria.

## 7. GLOSSARY OF TERMS

*(\*\*\*\*need to be updated for our most recent and frequently used terms\*\*\*\*)*

**AF** Abbreviation for acre feet; the volume of water that would cover one acre to a depth of one foot, or 325,851 gallons of water. On average, could supply 1-2 households with water for a year. A flow of 1 cubic foot per second for a day is approximately 2 AF.

**Alternative** A collection of actions or action categories assembled to provide a comprehensive solution to problems in the Bay-Delta system.

### **AFRP**

**Action** A structure, operating criteria, program, regulation, policy, or restoration activity that is intended to address a problem or resolve a conflict in the Bay-Delta system.

**Anadromous Fish** Fish that spend a part of their life cycle in the sea and return to freshwater streams to spawn.

### **BDAC**

**Best Management Practices (BMP)** An urban water conservation measure that the California Urban Water Conservation Council agrees to implement among member agencies. The term is also used in reference to water quality standards, watershed management activities, and others.

**Carriage Water** Additional flows released during export periods to ensure maintenance of water quality standards and assist with maintaining natural outflow patterns in Delta channels. For instance, a portion of transfer water released from upstream of the Delta intended for export from south Delta would be used for Delta outflow.

**Central Valley Project (CVP)** Federally operated water management and conveyance system that provides water to agricultural, urban, and industrial users in California. The CVP was originally authorized by legislation in \_\_\_\_\_.

**Central Valley Project Improvement Act (CVPIA)** This federal legislation, signed into law on October 30, 1992, mandates major changes in the management of the federal Central Valley Project. The CVPIA puts fish and wildlife on an equal footing with agricultural, municipal, industrial, and hydropower users.

**CFS** Cubic feet per second.

**Channel Islands** Natural, unleveed land masses within Delta channels. Typically good sources of habitat.

**Common Delta Pool** Delta provides a common resource, including fresh water supply for all Delta water users, and all those whose actions have an impact on the Delta environment share in the obligation to restore, maintain and protect Delta resources, including water supplies, water quality, and natural habitat.

**Common Program Element** Six programs elements for Water Use Efficiency, Water Quality, Levee System Integrity, Ecosystem Restoration, Water Transfers, and Watershed Management that are essentially the same for each of the three Phase II alternatives.

**Conjunctive Use** The operation of a groundwater basin in combination with a surface water storage and conveyance system. Water is stored in the ground water basin for later use in place of or to supplement surface supplies. Water is stored by intentionally recharging the basin during years of above-average water supply.

**Conveyance** A pipeline, canal, natural channel or other similar facility that transports water from one location to another.

**Core Actions** Actions that would be included in all CALFED Bay-Delta Program alternatives. Core actions are no longer viewed as a single set of actions. Rather, these actions are now distributed between the six common programs included in each of the three Phase II Alternatives.

## **CZMA**

**Delta Inflow** The combined water flow entering the Delta at a given time from the Sacramento River, San Joaquin River, and other tributaries.

**Delta Islands** Islands in the Sacramento-San Joaquin Delta protected by levees. Delta Islands provide space for numerous functions including agriculture, communities, and important infrastructure such as transmission lines, pipelines, and roadways.

**Delta Outflow** The net amount of water (not including tidal flows) at a given time flowing out of the Delta towards the San Francisco Bay. The Delta outflow equals Delta inflow minus the water used within the Delta and the exports from the Delta.

**Demand Management** Programs that seek to reduce demand for water through conservation, rate incentives, drought rationing, and other activities.

**Diversions** The action of taking water out of a river system or changing the flow of water in a system for use in another location.

**Drought Conditions** A time when rainfall and runoff are much less than average. One method to categorize annual rainfall is as follows, with the last two categories being drought conditions: wet, above normal, below normal, dry critical.

**Dual Conveyance** A means of improving conveyance across the Bay-Delta by both improving through Delta conveyance and isolating a portion of conveyance from Delta channels.

**Ecosystem** A recognizable, relatively homogeneous unit that includes organisms, their environment, and all the interactions among them.

**Entrainment** The process of drawing fish into diversions along with water, resulting in the loss of such fish.

**ESA (Endangered Species Act)** Federal (FESA) and State (CESA) legislation that provides protection for species that are in danger of extinction.

**Export** Water diversion from the Delta used for purposes outside the Delta.

**Fish Migration Barriers** Physical structures or behavioral barriers that keep fish within their migration route and prevent them from entering waters that are not desirable for them or their migration pattern.

**Fish Screens** Physical structures placed at water diversion facilities to keep fish from getting pulled into the facility and dying there.

**Groundwater Banking** Storing water in the ground for use to meet demand during dry years. In-lieu Groundwater Banking replaces groundwater used by users with surface water to build up and save underground water supply for use during drought conditions.

**HMP (Hazard Mitigation Plan)** One of two standards referred to in the alternatives for levee flood protection. Following the flood disasters of the 1980s, HMP standards were established at 1 foot of freeboard above the 100-year flood event level.

**Hydrograph** A chart or graph showing the change in flow over time for a particular stream or river.

**In-Delta Storage** Water storage within the Delta by converting an existing island to a reservoir.

**In-lieu Groundwater Banking** Replaces groundwater used by users with surface water to build up and save underground water supply for use during drought conditions.

**Inverted Siphon** A pipeline that allows water to pass beneath an obstacle in the flow path. For

example, an inverted siphon could be used to allow water in a canal to pass under a Delta channel.

**Isolated Conveyance Facility** A canal or pipeline that transports water between two different locations while keeping it separate from Delta water.

**Land Fallowing/Retirement** Allowing previously irrigated agricultural land to temporarily lie idle (fallowing) or purchasing such land and allowing it to remain out of production for a variety of purposes for a long period of time.

**MAF** An abbreviation for million acre feet, as in 2 MAF or 2,000,000 AF.; 10,000 cfs flowing for a year is about 7 MAF.

**Mine Drainage Remediation** Controlling or treating polluted drainage from abandoned mines.

**Meander Belt** Protecting and preserving land in the vicinity of a river channel in order to allow the river to meander. Meander belts are a way to allow the development of natural habitat around a river.

**Non-native Species** Also called introduced species or exotic species; refers to plants and animals that originate elsewhere and are brought into a new area, where they may dominate the local species or in some way negatively impact the environment for native species.

**Program Element** The program elements for the Phase II Alternatives include an element for Delta conveyance, a element for storage, and the six common program elements ( Water Use Efficiency, Water Quality, Levee System Integrity, Ecosystem Restoration, Water Transfers, and Watershed Management).

**Real-Time Monitoring** Continuous observation in multiple locations of biological conditions on site in order to improve management to protect fish species and allow optimal operation of the water supply system.

**Riparian** The strip of land adjacent to a natural water course such as a river or stream. Often supports vegetation that provides the important fish habitat values when growing large enough to overhang the bank.

**Riverine** Habitat within or alongside a river or channel.

**Setback Levee** A constructed embankment to prevent flooding that is positioned some distance from the edge of the river or channel. Setback levees allow wildlife habitat to develop between the levee and the river or stream.

**Shallow Water** Water with just enough depth to allow for sunlight penetration, plant growth, and the development of small organisms that function as fish food. Serve as spawning areas for delta smelt.

**Smolt** A young salmon that has assumed the silvery color of the adult and is ready to migrate to the sea.

**Solution Principles** Fundamental principles that guide the development and evaluation of Program alternatives. They provide an overall measure of acceptability of the alternatives.

**South of Delta Storage** Water storage supplied with water exported south from the Delta.

**State Water Project (SWP)** A California state water conveyance system that pumps water from the Delta for agricultural, urban domestic, and industrial purposes. The SWP was authorized by legislation in \_\_\_\_\_.

**TAF** Thousand acre feet, as in 125 TAF equals 125,000 AF.

**Take Limit** The numbers of fish allowed to be lost or entrained at a water management facility before it must limit or cease operations. The numbers are set for different species by regulations.

**Terrestrial Species** Types of species of animals and plants that live on or grow from the land.

**Through Delta Conveyance** A means of improving conveyance across the Bay-Delta by a variety of modifications to Delta channels.

**Upstream Storage** Any water storage upstream of the Delta supplied by the Sacramento or San Joaquin Rivers or their tributaries.

**Water Conservation** Those practices that encourage consumers to reduce the use of water. The extent to which these practices actually create a savings in water depends on the total or basin-wide use of water.

**Water Reclamation** Practices that treat and reuse water. The waste water is treated to meet health and safety standards depending on its intended use.

**Water Transfers** Voluntary water transactions conducted under state law and in keeping with federal regulations.

**Watershed** An area that drains to a particular channel or river, usually bounded peripherally by a natural divide of some kind such as a hill, ridge, or mountain.

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